

NATURE'S ¹³¹²
 CABINET
 UNLOCK'D.

Wherein is Discovered
The natural Causes of Me-
tals, Stones, Précious Earths,
Juyces, Humors, and Spirits,
 The nature of PLANTS in ge-
 neral ; their Affections, Parts,
 and Kinds in Particular.

Together with
A Description of the Individual Parts
and Species of all Animate Bodies, Simi-
lar and Dissimilar, Median and Organi-
cal, Perfect and Imperfect. With a com-
pendious Anatomy of the Body of Man,
As also the Manner of his Formation in
the Womb.

All things are Artificial, for Nature is the
 Art of God. *K*

By *Tho. Brown* D. of Physick.

London, Printed for *Edw. Farnham* in *Popes-*
Head alley near Cornhil. 1697

NATURAL
CABINET
UNLOCKED.

Which is Discovered



Th

A Description of the Individual Parts
and Structure of all Animals, Birds, Fishes,
Insects, and Vegetables, with a
particular Account of the Human Body,
As to the Manner of its Formation in
the Womb.

All things are Artificial, for Nature is the
Art of God.

By Wm. Brewster, D. of Physick.

London, Printed for Robert Taylor in Popes-
head Church Alley near Cornhill 1750.

(r)

OF

PHYSIOLOGY,

Treating of

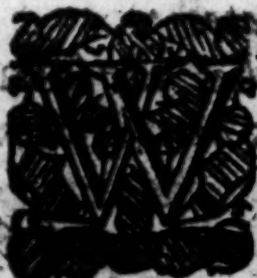
BODIES

Perfectly mixed:

With Comments thereupon.

CHAP. I.

Of Metalls.

I.  E shall here Treat
of those Bodies
which are perfectly
mixed, and sub-
stantial.

2. That Body is perfectly mixed,
which is made solid by the Con-
cretion

(2)

cretion of the Elements , and therefore daily grows harder and harder.

3. All the Elements do abide and are concentrated in a mixed *Body*, because all mixed Bodies are carried to a place of the *Earth*; and therefore much of earth must needs be in them: And if earth be in them, then water, without which earth cannot consist; for all Generation happens from their contraries; so that if there be one contrary, it's necessary that there should be an opposite contrary to that: *Arist. lib. 2. De gen. & corrupt. c. 8.*

4. And these Bodies are either *Inanimate* or *Animate*.

5. *Inanimate bodies* are such as are void of life; As *Metalls, Stones, precious Earths*.

6. *Metall* is a body perfectly mixed, and *Inanimate*, of *Sulphure* and *Quicksilver*, gotten in the veins of the earth.

7. *Sul-*

(3)

7. *Sulphure*. and *Quicksilver* is often found in the veins of *Metalls*: and of these, for the variety of the temperament, and mutuall permission y^e the *Professors* of the *Rosie Cross* do adjudge *Metalls* to have their original.

8. They define *Sulphure* to be a *Metallick matter*, consisting of a subtil exhalation, fat, and *anctuous*, included in the earth.

9. *Quicksilver*, (B) is a *Metallick matter*, consisting of a vapour more subtil then water; which is conglutinated with the earth, and cocted by the heat of *Sulphure*.

10. The *Peripateticks* will have a double vapour to lye hid in the bowels of the earth: the one dry, that is, more terrene then water; the other moist and glutinous, that is, more watry then *terrene*; and from these do *stones* and *Rofiles* grow; and these do produce pro-

per Metall, *Arist. 3. Met. c. 7.*

11. The Chymists do not differ from this opinion of *Aristotle*: for he maketh the matter of *Metalls* to be a remote vapour; They, a nearer matter, *Sulphure* and *Quicksilver*, which do grow from the aforesaid vapour, as the remote matter of *Metalls*.

12. The efficient Cause of *Metall*, is heat and cold; for heat, whether *Elementary* or *Celestial*, doth animate, digest, and exactly mingle all portions of matter: which mass so tempered, and prepared for this or that kind of metall, doth grow by cold, and is condensed.

13. The place in which *Metals* are ingendered, is the bottom of the earth, *Arist. 3. met. c. 7.*

14. Many are made amongst *Stones*; and that oftner in mountains than in plains; for according to their solidity, they do retain

(95)

retain their colour better; which is easily decayed and dispersed in plains, because of the softness of the earth.

15. If it be demanded, whether their form be one or more, (C) that is to say, whether they can be distinguished amongst themselves in specific differences, which do effect divers and incommunicable forms amongst themselves:

16. To the latter, it is agreed, First, Because every Species hath its Essence, and that perfect: Secondly, Its Definition: Thirdly, Its Heats: Fourthly, Its Strength and Use, *Scal. Exer. 106. f. 8. 2.*

17. But it is a great dispute amongst late writers, whether Metalls are Bodies Inanimate, or whether they Live? It is most certain they perform no vitall action, as other bodies that are endowed with a vegetive soul;

therefore they are not Animated,
Scal. Exer. 102.

18. But Metalls are either pure or impure.

19. Pure Metall is, when there is a perfect decoction exquisitely made; as in Gold and Silver.

20. Gold (E) is a pure Metall, begotten of pure Quicksilver, fixed, red, and clear, and of pure red Sulphure; not too hot, but well qualified.

21. This of all Metalls is the softest and tenderest, wanting firmness; It is heavy, having a sweet, pleasant, and excellent sapor and odor.

22. But whether the Chymists, by the industry of art, can make true and approved Gold, or is a question much disputed of late; yet in my opinion it is clear, that though it be very difficult, experience witnessing it, yet it is not altogether impossible; for
 if

(7)

if Art be a follower and imitator of Nature, I see not why Nature may not be imitated in framing of true Gold.

23. And whether it may be made potable, that is, so prepared, that it may be taken into the body without danger, is a great controversie between the Chymists and Galenists.

24. The favourers of *Galen* defend the Negative; to which *Scaliger* doth subscribe, being persuaded with these two reasons.

I. There is no similitude to be discerned between Gold and our Body, as there is between Aliment and Body to be nourished,

II. Because Gold is more solid, then that it can be overcome by our heat, or changed from its substance. *Scal. Exer. 272.*

25. Silver is a pure Metall (G) begotten of clear Quicksilver, shining white; and of pure Sul-

Sulphure almost fixed.

26. Such Metalls are impure, which do consist of impure Sulphure and Mercury.

27. Of these, some have more of the Humor or Mercury, and some more of the Earth or Sulphure.

28. Lead and Tinn do participate more of the Humor.

29. Lead (H) is a Metall procreated of much crass, and less pure Quicksilver, and burning Sulphure.

30. Its Species are various, according to the matter of which it consists, and the heat by which it is cocted.

31. And hence it is black or clear.

32. Black-lead doth consist of impure Quicksilver; and it is less elaborate, therefore of a baser value.

33. Clear or White-lead, is fully

(2)

fully cocted, and doth consist
somewhat of a more purer mat-
ter.

34. Tin (I) is a White-metal,
begotten of much (yet not so
pure) Quicksilver, outwardly
white, but inwardly red; and of
impure Sulphure not well digest-
ed.

35. Brass and Iron, have more
of Earth; to which is added Cop-
per.

36. Brass (K) is an impure
Metall, begotten of much Sul-
phure, red and gross, and a little
impure Quicksilver.

37. Cyprian Brass, is a Spe-
cies of it, which doth grow copi-
ously in the Island *Cyprus*; whence
it is called *Cuprum*.

38. Iron is (L) a Metall im-
pure, begotten of much Sulphure,
Crude, Terrestrial and burning;
and a little impure Quicksilver.

39. And although it be hard,

yet it is bruised with daily labor,
because there goes to its genera-
tion less Quicksilver, or Humor,
but more Sulphure or Terrene.

40. Copper is factitious Brass
clarified, of the colour of Gold,
or rather more yellow.

41. The Native is now of no use,
and therefore by some rejected
from the value of Metalls.

42. Though in times past, the
Native was in much use, and
more nobler by far then Brass:
As *Pliny* witnesseth, *L. 34. c. 2.*

The Commentary.

(A) **T**He name Metall, is deri-
ved from the Greek
word *μεταλλειν*, which is to search;
because it is sought for with
much pains and cost, in the
Veins and Caverns of the Earth.

Pliny adjudges it to be derived
from *μετα εἰς ἄλλα*, which signifies
near

(11)

near another; because where one Vein is found of Metall, not far from thence another is found: For they have a kinde of sympathy with them, as Gold and Silver, Brasse and Iron.

Others are called Minerals, which are generated in the Veins, Pores, and Bowels of the Earth; those are called Fossiles, which are digged out of the Earth.

Fossiles are separated and distinguished from Metalls, by *Aristotle 3. Met. ch. 7.* because Fossiles are cast up out of the Earth, onely by digging, needing no other art, or further labor, for their discovery: But Metalls are much boyled, and separated by the fire, and purged several ways, as need requires.

Now the definition of Metall delivered, doth consist of a genus and difference: The Genus is a Body, because a Metall doth receive

ceive three Dimensions; the Difference contains four.

In the first place, it is called a Body perfectly mixed, to the difference of Meteors; for there is not so light a concurrence of Elements in Metalls, as in Meteors.

In the second place, it is called Inanimate, to difference it from Animate, as are Plants and Animals; whence *Brighton* did right Comment in *Scribonius*, who defines Metallick-bodies, imperfectly to be called Animates: If they have a soul, they must have it perfectly, because the soul doth not receive more or less of quantity, but is the very perfection and absolution of a thing.

The opinion therefore of *Cardan* is to be reprov'd, who asserts all Metalls to be perfect Animates; but seeing they produce no vitall action, they cannot have a soul attributed unto them.

In the third place, the matter of Metall is credited to be Sulphure and Quicksilver, which are as it were the Father and Mother of Metalls; which two are mingled variously; and from the mixtion of these two, are all Metalls immediately procreated. But *Cardan* resists this opinion, who denies that Metalls do consist of Sulphure and Quicksilver; and that upon this account, because by the act of two Existents, a third cannot be made. *Scaliger* answers, *Exer. 106. sect. 6.* that it is the property of things mingled, that by the act of many Existents, a third to be made: And *Cardan* himself doth affirm, that Copper doth consist of Tinn and Brass, which are two, in one existent act.

Aristotle following *Plato* in *Timæus*, doth demonstrate of a double vapour, doth lie hid in the bowels

bowels of the earth; The one dry, that is more terrene then watry; The other Humid and Glutinous, that is, more watry then terrene: From the former, he thinks hard Fossiles, as stones, to grow; and from the latter, that which is properly called Metall.

But this Controversie may easily be reconciled, if we say that these vapours or habits, are the more remote matter of Metalls; but the proximate and proper, to be Sulphure and Quicksilver: But let it seem strange to none, why such hard bodies, as Metalls are, should be generated of vapour; for this vapour is Crass and Fumid: whence it happens, that in those Pits and Mines, where Metalls are digged, that many are suffocated and killed by those vapours; and hence it is that those who are daily laborers therein, are noxious to vari-

ous

ous Diseases and Catarrhs: But I say, that the matter of Metalls is not simply a vapour or watrish humor, but that which is more watry then earthy; for the watry vapour, simply, cannot be the matter of Metalls: For how should they then cohere, or how come Metalls so solid? Hence it is that they have certain mixed parts of that and slimy earth; yet notwithstanding, they obtain more of water then of earth, because they may be powred out & melted; which can never be done, without there be some inward moisture; for it is the faculty of an humor to soften: & therefore those of them that have most humidity: as Gold, Silver, &c. are the soonest powred out and melted; but such as have but little humor, as Iron and Brasse, are hard to be melted.

But it is said in the definition, that Metalls are begot (as by sperme)

sperme) of Sulphure and Quick-
 silver, mixed and tempered. In
 which words the efficient Causes
 are included, which are two,
 Heat and Cold; Heat indeed
 doth precede, Cold follows the
 generation of Metalls: for Heat,
 whether Celestial or Elementa-
 ry, doth mingle, digest, temper,
 and concoct, all the portions of
 the matter; which mass so tem-
 pered, is rudely prepared for this
 or that kinde of Metall, and so
 grows and condenses with cold;
 for because all Metalls are dissol-
 ved by the force of heat, then it
 remains, that they must be con-
 creted by cold; so that it is need-
 ful, that one contrary be the cause
 of another: What is more clear-
 er to sence, then that which is
 soluble by heat, must needs con-
 dense by cold? For if Gold, Sil-
 ver, or Lead, be melted, and re-
 moved from the fire, they pre-
 sently

sently come into their pristine form; for cold is the privation of heat; and according to the various preparations of that mixtion, divers kindes of Metalls are gotten of the same Mass: for by how much more subtil and defecate the matter is, by so much the more nobler and purer the Metall will be. In brief, all Heat and Splendor, and all the Excellency of Metalls, doth depend upon a decent and legitimate mixtion and temperation of the matter; unto which the temperature of the Air, the soyl of the place, doth much profit; for the various Influence and Efficacy of the Sun, Moon, and Stars, as in other things, so in the procreation of Metals, is of great moment: And hence it happens, that all sorts of Earth will not bear Metalls; although the matter of it be contained within it: So

So we see also in such Regions as are too dry, as *Affrica*, that Metalls will not easily be generated, because the matter, to wit, the moist vapour, doth not abound there; nor in Regions too cold, will Gold or silver be found, but in places onely moist.

Fourthly, In the definition, the Veins of the earth are the subject of Metalls; for these are as it were the mothers of these Bodies: but sometimes they are found in stones, and that rather upon Mountains, then Plains; in higher Places, rather then Groves: for according to their solidity, they do retain their colour better; which in Plains is sooner dissipated, by reason of the softness of the earth.

And this shall suffice for the explication of the Definition.

(B) It is called *quick*, metaphorically, because it always moves.

And

And it is called *Mercury*, because as Mercury is joyned to all the Planets, so this to all Metals; or as Mercury turns round, so is this moveable: But why doth Quick-silver, like a drop of water, in powder, or dust, and also upon a dry substance, be globular and round? The question is subtil and difficult.

Cardan renders this reason: What things are dry, do fly from touching or mixing with their contrary; and therefore in hatred thereof, is compelled into a globular form. This opinion is refuted by *Scaliger*, *Exer.* 105.

1. This happens not in a dry substance onely, but in water, which is moist.

2. That it will gather it self in the dust of Lead, and not fly from it, because Lead is like to the nature of Quicksilver; and therefore it doth not fly from its nature

nature, but rather desire it.

3. A drop of water, when it falls in the air, is globular and round, but doth not refuse the air which is moist; therefore the flight from dryness, will not be the cause of its globular form, if it be the same in moistness: But the truest reason is taken from the material cause, to wit, Quicksilver, for its exquisite mixture of moist and dry, to be forced into one, and conglobulated: for pure water alone cannot be convolved into a globular form; but if there be any thing of earth exquisitely mixed with water, then indeed it will be globular, as we see in drops falling upon dust, with which as soon as any dust is mingled, it becomes round; for from dryness it received a certain firmness to cause that roundness: From which Example, the substance of Quicksilver may be easily

fly understood, because it hath the same form, way, or station, in nature, as water gathered in dust; therefore Quicksilver, according to the definition of *Staliger*, is nothing else then a watry earth, or earthly water, not without much air: and I shall adde to these, another cause of conglobulation, both from the form and the end desumed: For whatsoever they be, they are always one; but unity in its kinde, is excellently preserved in a globular form, because there is nothing different, nothing absent, no inequality; and therefore Quicksilver, that it might better conserve its unity, it goes into a globular form.

(C) It is a Controversie to this day agitated, whether Metalls are distinguished amongst themselves, in specificall differences, which do effect divers and incommunicable

i. Every thing that is nourished, or generated, doth live: Every mingled Body is nourished, or at least generated; therefore it lives.

To this *Scaliger* answers, by denying the Proposition: The Tophus or Gravel-stone is generated, yet it doth not live, because it wants a soul; therefore the name Generation is common to all things, generable and corruptible, as also to Inanimate and corporall Simples; for this water is generated of the air, without a living soul.

The second reason, which is judged the most valid, is this: Where there is heat, there is a soul; where a soul, there is life. In a Stone there is heat, therefore also life and soul. The major is deniable; for in fire there is heat, which notwithstanding wants a soul: the minor also is false; for

a stone is rather cold then hot.

3. Attraction comes from the soul; the Loadstone attracts Iron, therefore it hath a soul, or is animated. *Scaliger* answers, That all attraction not to be from the soul, as is plain from fire, which doth gather and attract its kinde, neither is it animated.

4. Metalls have Veins and Pores, therefore the office and end of Veins; the end is the passage of Aliment, but Aliment is onely of the soul. *Scaliger* answers, and denies the first, That there is no true Veins in Metalls, but rather certain Internalls, by which the parts are distinguished: and grant they were true Veins, and necessary, then they would be found in all Metalls, which are not in the most precious Metalls, as in Gold, the Adamant, and others; therefore they are not true.

D

5. Metalls

municable forms amongst themselves; so that one kinde of metall cannot be changed or converted, into another; or rather do they differ in the manner of perfection, and imperfection. This last Tenent is defended by the Chymists; to which, *Cardan* and *Danews* subscribe. The first the followers of *Galen* and *Jesius Scaliger* defend.

Reas. 1. Metals have their divers Definitions, divers Colours, Strength, Scars, Weights, and many such like differences between them.

2. In Species, what is imperfect cannot be reposed, or exist in any Species; for the Essence of every thing, is indivisible; but the Essence alone, is perfection, As *Scaliger* saith, *Exer. 106. sect. 2.*

3. Metalls, between themselves, are not changed; therefore they have a proper and compleat

pleat Essence, and do differ in specificall forms. I confirm the proposition; for either its nature must change, or art: But it doth not change its nature, because its place is not outward, as to operation; then much less art, which is an imitator of nature.

4. Saith *Scaliger*, there are both other Metalls appointed by nature, that of them Gold should be made, and other Animates, that of them man may be made: Therefore it is not true, that Gold is the perfection of Metalls. So *Thomas Erastus* his second Part of dispute against *Paratelsus*, and *Iacobus Albertus*, and *Thomas More*.

(D) In this place, that long controverted Point, whether Metalls live, or produce vitall action, as other Bodies do, that are endowed with a vegetable soul? *Cardan De subtil. lib. 5. pag. 150.* doth affirm it; and these are his reasons.

1. Every

5. Metalls do grow, therefore they have a vegetable soul. I answer, Metalls do grow and increase, not by the benefit of a soul, but rather by accretion or apposition of parts extrinsically adhering, no otherwise then as a stone in the bladder; therefore a soul cannot rightly be attributed unto them.

6. Metalls do suffer Diseases and old Age, as *Albertus* doth attest; which must necessarily proceed from life.

We answer, That old Age and Diseases are metaphorically given to them, when by much preservation, we say they have lost their first goodness and vertue; as *Scaliger* doth instance in the Adamant, which never can be said to wax old.

(E) These properties are denoted of Gold; First, that it is of all Metalls, the most softest and

and tenderest, and therefore it may be dilated into a thin leaf, insomuch that one ounce of Gold will cover eight of Silver.

2. It wants fatness, and therefore it doth not tincture, nor defile, neither is it consumed with fire; for Gold, according to *Aristotle*, of all Metalls, loses nothing in the fire; the oftner it is burnt, the better it is.

3. It is heavy, considering the thickness of its substance, because it is compacted well with heat.

4. It hath a pleasant and excellent Savour, and Odour; for it is temperately hot and dry, whence it is said to exhilarate the heart of man, and to corroborate the vitall Spirits: Native Gold is found in the mountains about *Arabia*; in Caverns and Ponds in *Germany*; in Rivers at *Tago*, and sometimes in the heads of Fishes: it is also generated

and mingled with other metalls.

(F) There is a great Controversie amongst latter Chymists, and followers of *Galen*, whether Gold may be made potable, or no; that is to say, so prepared, that without any danger it may be received into the body? the Chymists stiffly maintain it, and by this very golden Potion, have miraculously preserved, restored, increased, repaired, the strength of the heart, and principall members, lengthned out age, and revoked youth. The *Galenists* deny it: To which *Scaliger* subscribes, who confutes them with these two Reasons especially:

1. Between Aliment and the Body nourished, there is a certain necessary similitude: but between Gold and our Body, there is no apparent similitude, but far different from our nature; therefore Gold cannot nourish our Bodies,

dies, nor restore strength. I prove the minor: our bodies are concreted especially of mixed elements; for the elements by the various and almost infinite mixtures, are infinitely altered and changed, before they become fit matter for Animalls; but there are but few mixtions, that do precede the concretion of Metalls, and therefore elements that are but lightly altered and changed, do exist in them: and what similitude is there between Inanimate and Animate?

2. Whatsoever cannot be overcome and changed by our native heat, that cannot possibly recreate our native bodies: Gold is such-like, therefore doth not nourish. The minor is proved, because Gold is of a solid and hard substance, insomuch that it is impossible for it to be melted by coction, like to Aliment.

(G) The nature of Silver is cold and moist, and it is found in deep Mines; sometimes it is entangled with stones, hairs, trees, fishes, whole serpents, scorpions, with the Species of many other things which it brings with it: Now for the generation of Silver, there goes more Quicksilver then Sulphure, because it represents its colour, and whilst it melts, it contains almost all its accidents in it self, for it doth not melt, nor is it diffused, as water and oyl, nor doth it adhere to the Tangent, which are the faculties of Quicksilver, and hence it is that it is not so ponderous as Gold. Now that a certain portion of Sulphure doth concur to the procreation of Silver, is clear by this, because a sulphurous odour doth offend the nostrils, when it is melted; the natural mixture of this metal is not so absolute and

and perfect, as Gold: and hence it is that it doth not resist the fire, like to Gold, but every time that it is melted, something is lost of it: and it is more easie to engrave, then Gold; neither are the liquors which remain in Silver vessels for severall days together, so sincere and clear, as those in Gold, but become after a certain manner venenate, both in odor and sapor; especially if the liquor be sowre or sharp.

(H) That there is much crudity and imperfect concoction in Lead, the facies demonstrate, which is left when it is melted; and hence it is, that it doth not sustain the fire as Gold, but doth easily melt and consume by fire; if it long remain therein, it will be brought to ashes: yet it is thought to increase of its own accord, when it is laid upon the roofs of houses, both in weight

and quantity. *Galen* rehearses a story of Lead, buried in a humid place under the earth, to have increased both in magnitude and weight: It is of a cold and astrictive nature; hence it is that many leaden vessels are hurtful, especially that Lead which is white.

(I) Tinn doth differ from white Lead, because this doth arise by it self, the other always with Silver: And although Tinn doth emulate the splendor of Silver, yet it is far better, and doth exceed more from the fire: whence it is judged of many to be a Species of candid Lead; but in the excellency of its nature doth far exceed Lead; its substance is thin, and less excocted.

(K) Brass having more mixtion of earth then humor, doth melt more difficultly, because all its humor is almost dried away;
for

for which cause it is of greater price and esteem than Iron: and therefore in ancient time, Armour and Weapons were made of Brass, Bucklers and Launcers also; so highly was this Metal esteemed.

(L) Iron is found in deep Mines, a powdry Mass, red and ponderous. Now to the generation of Iron, there is less Quick-silver, but more of Sulphure; hence it is that it is so hard and obscure; and the hardest of all is steel, which is onely a species of Iron, or Iron purged, and so hardened by many quenchings in water; and hence it is, that it is more frangible than Iron. Native Steel, in times past, was found about *Thrace*, where the people *Chalibes* do inhabit.

CHAP. I.

Of Stones.

I. **M**etals being explicated,
Stones do follow; which
neither the heat of the sun,
or the blows of the hammer; can
extend.

2. Stones are (A) Bodies perfectly mixed, inanimate, hard, of a dry exhalation, mingled with a certain watry unctuosity, by the continuance of time, the strength of heat and cold, and so conglutinated by a mineral vertue.

3. These like as other friable Bodies, of which a little after, because they have in them Sulphure and Quicksilver, of a weak nature, are not accounted by some for Metals.

4. Stones (B) are both vulgar and precious.

5. The

5. The Vulgar do congeal of a gross and impure matter.

6. And they are either Porous, or solid.

7. They are porous, which do consist of a matter not well compacted; and therefore they have rare or thin parts, as the Tophas and Pumice.

8. The Tophas is a stone thin, easily to be crummed, or friable, rough, and not equal.

9. Here it is disputed, whether it be cold or hot: This Cardano affirms; which Scaliger refutes, saying, Who told thee that the Tophas must be hot? It cannot be discovered, by the touch, or the taste; or medicinal experience, such a quality was never found out, or experimented,

Exer. 17.

10. The Pumice (C) is a Stone rare and cavernous, or spongie, very fit to be rubbed to powder;
of.

of which there are three sorts, according to *Scaliger, Exer. 133.*

11. Solid stones are those, which have continuat parts, and strongly coacted.

12. And these either do want Nitre, or endeavor it: those that want Nitre, are these; the Flint, the Whetstone, a Rock, the Emerald, the Marchasite.

13. The Flint is a solid and hard stone, whence if it be smitten upon with Steel, fire will appear, *Scal. Exer. 108.*

14. The Whetstone is a solid stone, wanting Nitre, consisting of little grains; whose use is to sharpen iron.

15. The Lydian stone is a Species of the same, which if any metal be rubbed thereupon, it will discover the true from the counterfeit.

16. The Rock is a stone large and hard, consisting of a great quan-

quantity of matter strongly con-
creted.

17. Khe Emrod is a hard stone,
which doth cut glass.

18. The Marchasite is a stone,
upon which if any hard body,
as Steel, be struck, sparks of fire
will erupt.

19. Solid stones, which incline
to Nitre, are these:

20. Marble is a solid stone,
precious and clear, bespangled
with various colours and spots.

21. And according to the co-
lour of it, various species and dif-
ferences do arise; but especially
the Alabaster, the Ophite, and
Porphirite.

22. The Alabaster is clear Mar-
ble, and white, of which boxes
for odoriferous spices are made.

23. The Ophite, is a Marble
with spots like to serpents.

24. The Porphirite is a Mar-
ble, distinguished with reddish
spots,

spots, garnished therewith like stars.

25. Precious stones are 'congealed of a subtil and tenuious matter, by the onely influx of heaven; and they are called (D) gemms.

26. Yet in other places, for the diversity of the suns beams, other precious stones are produced.

27. Hence Precious stones are generated in Ethiopia, and India, by reason of the vicinity of the oriental and meridional Sun; because there the matter is better cocted. See *Scal. Exer. 99.*

28. A Gem therefore is a precious stone, of famous and noble vertues, engendred of a most subtil and elegant matter.

29. *Pliny* reckons up many occult vertues, that it is endowed withal, *lib. 37. c. 10.*

30. The Adamant is (E) a translucid Gem, of a shining colour

our, not unlike to iron; of a great hardness, and greater price.

31. And it is either begotten without Gold or in Gold.

32. That which is gotten without Gold, is in bigness of the Indian hazle nut, but that of Arabia is lesser.

33. That which is gotten in Gold, is, First the Adamant, called Cenchros, answering the grains of Gromwel-seed; Secondly, the Macedonian, proportionable to the seed of Cucumber; Thirdly the Cyprian, which is of the colour of Brass; Fourthly, the starry Adamant, called Syderites, shining in colour like Iron: and of this latter, there are two kinds to be had.

34. But so great is their hardness, that they will resist the blows of Iron hammers; neither will they give place to the furious flames of the fire, but are onely bro-

broken with the blood of a Goat; especially, if the Goat before his blood be shed, eat Parsly, and Silermountain, with a little wine; and the reason why it should do thus, *Scaliger* professes he knows not, *Exer.* 344.

35. The Saphire is a (F) transparent Gem, of great hardness, endowed with a blue and celestial colour; preserving chastity, and corroborating the heart.

36. The Smaragd is a transparent Gem, fragil, though hard; of a green colour, but clear, and sometimes of an earthly colour.

37. They call this the chaste Stone, because it is believed to break in the act of copulation, and resists venery, *Scal. Exer.* 33. *sec.* 2.

38. The Hyacinth is a Gemm of a small magnitude, shining like unto a violet-colour; comfort-
ing

ing the heart, and exciting cheerfulness.

39. The Amethyst is a Gem, obtaining the same colour with the Hyacinth; onely, that it glitters more with purpureous fulgor.

40. According to the opinion of *Aristotle*, if it be applied to the Navel, it draws to it the vapour of winde, and so discufses it.

41. The Carbuncle or Pyropus, is a Gem, representing the flame of clear fire; it is a great enemy to poyson.

42. The Chalcedony is a Gem also clear and beautiful, shining like unto stars; whose vertue is to resist fear and sadness.

43. The Ruby is a red Gemm, shining in the dark, like a Species of a spark.

44. The Chrysolite is a shining Gem, of a golden colour,
it

glistering with variety of light ;
and resists melancholy.

45. The Alterite is a hard
Gemm, and splended ; which if
it be turned, will shew the sun
and moon shining within it.

46. The Achates is a Gemm
(H) excellent in the variety of
colours ; which one, may be op-
posed to all the colours in other
Gems ; and it is a great prefer-
vative against pestilent poysons,
and it is believed to help the me-
mory much , and increase pru-
dence, *Scal. Exer.* 117.

47. The Sardis is of a deep yel-
low colour, making men joyful,
sharpening wit, and stencheth blood
flowing from the nostrils.

48. The Jasper is a green Gem,
bespangled as it were with spots,
representing drops of blood ;
which if hung upon the ventricle,
doth strengthen it.

49. The Onix (I) is a pellucid
Gem,

Gem, like unto the nail of a mans finger in colour.

50. The Turcois is an obscure Gem, of bluish colour, yet somewhat inclining to a green; it recreates the heart and sight.

51. And these are the noblest of Gems; those that are less noble, are the Chrystal, Coral, Blood-stone, and Load-stone.

52. The Chrystal (K) is a pellucid stone, clear, and concreted of Ice vehemently congealed; as much of it is found to be generated under the earth, where winter-storms and snow is frequent, as about the Alpes.

53. The Coral (L) is a Ramousstone, begotten of a plant of the sea, hardned by the air.

54. And it is white, black, and red; the last whereof, is the noblest and best.

55. Gagates or Amber, is a stone, begotten of liquid Bitu-
is

men, flowing on the sea-shore, and condensed with cold.

56. And there are three sorts reckoned up; the yellow, which is of the colour of Honey; the second is of the colour of Muscadine; the third is candid, which is judged the best.

57. The stone Hematites, is externally of the colour of blood, inwardly like to iron; and of so great hardness, that it can scarce be pierced: it stanches blood.

58. The Loadstone (M) is endowed with bluish green colour, attracting iron by a natural faculty. *Aristot. lib. 7. Phys.*

57. Those Stones are reckoned amongst Gems, which are generated in the Bodies of Animals, by a peculiar glutinous seed, and is concocted by native heat in a little progress, and so by cold congealed.

60. The most noble of them,
are

are those which are found in terrestrial Animals; the Chelidony, which is a slender stone, found in the ventricle of yong swallows, mingled with a black but reddish colour.

61. The Alestory is a Stone, more obscure then crystal, generated in the ventricle of a goat, about the ninth year of its age, and about the bigness of a bean.

62. Ætites is a Stone with a hard cortex, scabrous and light, found in the nest of an Eagle.

63. Borax, otherwise Cheloutites, is a Stone found in the head of an old and great Toad.

64. *Quadrus* is a Stone found in the brain of a vulture; *Quiris*, in the nest of the bird *Upupa*; *Saurites*, in the belly of a Lizard; *Limarius*, in the head of a Snail not covered with a house.

65. These Stones are found in water-Animals; *Gemma percarum*, found

(46)

found in the head of a little fish, called a Pearch; *Lapis Carpius*, found in the jaws of a Carp; *Oculi Cancrorum*, are stones clear and white, found in the eyes of Crabs, especially in the females.

66. The Margarite is (N) a Stone, begotten of sea-shell-fishes, being of a globular form.

The Commentary.

(A) **T**He matter of Stones is a watrish humor, and an unctuous and gross earth: Stones are not procreated of the earth alone, because its parts are dry, and easily dissipable into powder, but also of a certain humid unctuousity, which as glue doth connect the earthy parts together: nor can this simple humor alone, flowing by it self, and of its own nature, constitute stones, but earth is necessary to the composition.

tion, which doth afford matter for the unctuosity to astringe; therefore stones are gotten of gross earth, by the coalition of this humour: which must be so understood, not that the two other elements, to wit, the fire and the aire must be separated from their mixtion, if so be the opinion of Philosophers be true, that every mixed thing doth consist of four Elements.

The efficient causes of Metals or Minerals, are two; heat and cold: heat persisting in the matter, doth diduce moisture, and unctuosity of the terrene substance, by certain tender parts, and so doth coct and digest, and perfectly mingle the portions of the severall elements, but especially of water and earth, and so purge them from all the excrementitious parts, and at last doth prepare that matter rightly to pro-

produce the form of a stone ; and so cold at length doth condensate it with its astrictiveness, & expel all its superabundant humor, and so indurate it into a stone.

But some may say, that cold rather is the cause of corruption, then generation : I answer, it is true in Animate bodies, but in Inanimates, to wit, in meteors and metals, coldness is the cause of generation. Yet it may further be objected, If stones do coalesce from coldness ; it follows by the same rule, that they must melt by heat, and so be resolved ; but that cannot be, and therefore nor the former. I answer, Stones cannot be melted by heat alone, without the affusion of some other humor, because there is in them such an exquisite & natural commixture of moisture and dryness, that they refuse liquation by their contraries ; neither are they to be reduced

duced to the action of their external faculty, without the sympathy of some familiar quality.

(B) According to the divers and various subtilty of the matter, whether pure or impure, crass, viscous, or the like; Stones, both pure and impure, noble and ignoble, are ingendred; whence it is that there is so great variety of Stones and Gemms: and here an objection will arise, whether precious Stones may change the matter of the earths generation? Gems, because of their noble fulgor and transparency, do not seem to persist of earth, which is dusky and blackish, an enemy to such pulchritude; whence many are of this opinion, that Gems are partakers equally of celestial fire and water, and from them to receive their fulgor and cristalline clearness. But we must know

E

that

that Gems, also, do consist of certain earthly matter; but not obscure, but subtil, mixed with a watrish humidity, well cocted and tempered: for the matter, according to Logicians, doth vary the dignity of things, but the propinquity of the sun, coctes better and stronger the matter of Stone in Oriental regions, makes the Gems and Stones, both more excellent, and precious. Another question will here arise, whether Stones do differ in forms and species? We maintain the affirmative, with this one undeniable reason; divers actions and vertues do arise from divers Forms; but there are divers actions in divers Stones; therefore, &c. The assumption is proved, because one Stone resists poyson; another discusses swellings, another draws iron; which are indeed divers effects.

(C) *Pliny* relates of the generation of the Pumice, that it is gotten of Fruits, some of Bayes, some of Thyme, beyond the Columns of *Hercules*, which are transformed into the Pumice: which if it be true, it is not strange, why the Pumice, cast into the water, doth swim, when it is made of porous and rare matter, and therefore it hath its levity from its matter, and will not sink to the bottom of water: but that for use is accounted the best, which is candid, light and very spongius. The flower of it, according to *Theophrastus*, doth take away drunkenness.

(D) A Gemm properly is the sprouting or bud of a Tree, fair, and round, bunching out at the first out of bunches, and chiefly of Vines; and so those precious Stones which resemble this form, are wont to be called Gems, &c.

cause they respond thereunto in figure and form. But the vertues and the effects of Gems are wonderful, if we may believe *Cardan*. Some, says he, are effectual in prolonging life; others available in love, in obtaining riches; some for divination, others for consolation; some for wisdom, others for good fortune: some work effects to make men dull, others joyful; some sad, others fearful: some do resist poyson, others help the concoction of the ventricle and liver. But concerning the vertues of Gems, read *Scaliger*, *Exer. 106*.

But Heaven no doubt hath infused into Gems, many admirable properties and vertues; concerning which, *Hermes Trismegistus* hath sufficiently treated.

(E) But why doth the Adamant preserve its substance whole against the weighty stroaks of the ham-

hammer, and furious flames of of the fire, yet suffer it self to be dissolved with the blood of a goat? There are some of our later writers, who will admit of no occult property at all, but go about to manifest every thing by plain reason; therefore they judge goats blood, by reason of its analogy, which is in the beginning common, to pierce the Adamant. But says *Scaliger*, what other thing is that analogy of its common principle, then an occult property? No doubt but it is a great miracle of nature; and why it should pierce so hard a body, no man well can demonstrate.

(F) The Carbuncle comes from the Eastern regions, shining like to white clouds; but because it hath golden spots, it is reckoned by some amongst Gems.

(G) Of which there are three

sorts: First, that which shines in the dark, they call Pyropus; secondly, that which is put in a black vessel, shining, water being powred upon it: thirdly, that is the basest, which glisters onely when the light shines.

(H) Achatas is of so many various kinds, that it will scarce be credited to be one stone; for it is clear, red, yellowish, cineritious, green, dark, blue; inso-much, that this one answers to all the colours of other Gems.

(I) *Albertus Magnus* relates, that he hath tryed this, that if this stone be hung about the neck, it roborates the strength of the whole Body: which is incredible; for by its frigidary it constringes the spirits: By the same reason it is related, that if it be hung about the belly, it hinders venery; whereupon the Indians everywhere preserve themselves.

(K) Whe-

(K) Whether chryſtal be glaſs, is a ſubtil controverſie, between *Cardan* and *Scaliger*. He denies it, upon this reaſon, becauſe glaſs is diſſolved by the fire, but chryſtal not, unleſs for ſeveral days it lie in the miſt of a vehement fire, and be continually blown: therefore Chryſtal can never be glaſs. *Scaliger* answers, glaſs that hath never obtained the hardneſs of a ſtone, is as yet water, and therefore eaſily diſſolvable by fire, becauſe it is but congealed with a little cold; but when it is concreted and congealed by a diuturnal cold, inſomuch that it hath obtained the perfect form and hardneſs of a ſtone; it will not eaſily melt, or not at all: but it is generated oftentimes under the earth, and ſometimes upon the tops of high mountains, where there is perpetual ſnow; therefore it muſt needs be congealed into

a hard substance, for much of it is brought from the Alpes, Helvetia, and Italy.

(L) Coral is called by the Greeks *νεβηλον*, as it were a shrubby stone; for it is called *frutex marinus*, because being extracted from the sea by the air, it is hardened into a stone, under the water: the Coral is green and soft; but as soon as it is taken out and reposed to the air, it grows hard and red, because of the tenuity and subtilty of the air, which compels and hardens its parts.

(M) The Loadstone is called *Magnes*, as is supposed, from its first finder out: by some it is called the Herculean stone: it hath a wonderful vertue in attraction; it doth not onely strongly draw iron to it self, but also infuse an attractive vertue into the iron drawn; insomuch that it will attract other iron to it: which thing

thing can hardly be demonstrated with reason. If any say that iron is drawn by the similitude of substance, he errs not; for similitude and the flight of the vacuum are the two causes of attraction: heat draws by the flight of the vacuum; every part doth draw its proper aliment, according to the similitude of the substance: whence iron is as it were the aliment of the Loadstone, and therefore it is drawn by it; for in the flakes of iron, the Loadstone is preserved; although *Scaliger* by no means will assent to this: But we say that iron is the proper aliment of the Loadstone, not so as to say that it lives, as *Scaliger* well infers, but as it were nourished by it: But as the Elements move spontaneously to their places, as to their end and perfection; so the Loadstone, because it is kept in the fi-

lings of iron, and as it were nourished by them, moves to the iron; therefore we may well rest in the opinion of the antient, that iron is drawn by the Loadstone, by the similitude of substance; and therefore it is that this stone is of the colour of iron. Yet some say, that the Loadstone doth not always draw iron: I answer, That happens by accident; for when the Adamant is near, it hinders and impedes its attraction. *Cardan* yet denies that the Adamant can hinder the attraction of iron, or can be hindered by Leeks and Onyons; but maintains, that it will always attract iron; as he hath proved by experience.

(N) The manner of the generation of Pearl, is this; Shell-fishes in the spring time, being incited to the desire of copulation, or conception, whereupon they
come

come out to the shore, and dilate themselves, attracting the heavenly dew; return, as it were, burdened, and so bring forth Margaries: Hence it is that there is so much difference in the goodness of the Pearl, which happens according to their age or magnitude, and also the quality of the dew received: of round shell-fishes, the best Pearls are gotten. These are the best Pearls, which are found in the bottom of the sea; and sometimes found floating upon the shore.)

Gen. 1. 3.

Of Juices or precious Earths.

I. **V**E having explained the Nature of hard metallick Bodies, we shall now treat of such as are soft, which precious Earths are of a middle Nature

Nature, between Metals and Stones.

2. And many of these Bodies are fricable, that is to say, rubbed small, or brought into fine powder.

3. Some of these may be melted, others not; those that are soft may, that may be hardened into the body of a stone.

4. Of the first kinde of these, are those that are dry and concreted; as Salt, Alom, Bitumen, Vitriol.

5. Salt is (A) a metallick Body, friable, begotten of a humid and watry Juice and gross earth, mixed and boyled together.

6. It hath force to absterge, expurge, astringe, dissipate, and attenuate.

7. And it is either Natural or Artificial: that which is Natural, is called Fossile; that which is Artificial, Factitious.

8. The

8. The Fossile, is found either in the Earth, or out of the Earth.

9. That which is found in the Earth, is either digged out of mountains, or effoded out of the fields or sandy places.

10. Of these there are various differences, according to the diversity of places where they are found; but four especially are most known to us: *Sal Ammoniack*, *Sal gemm*, *Sal Nitre*, *Indian Salt*.

11. *Ammoniack* is a bitter salt, found in or about the sand of *Cyrene*; whence it is called *Cyrenaicus*.

12. *Salt Gem* is a Fossile salt, found in Mines or Pits, shining, and resembling the form of *Chrystal*.

13. *Salt Nitre*, or salt-Peter, consists of a coagulated humor, in moist subterraneous places, shining like to congealed snow upon walls,

walls : to this day by art it is made.

14. The Indian is a salt, blackish, cut out of the mountain *Oromontus* in the Indies.

15. Those Salts that are found out of the Earth, are such as are digged or effoded out of waters; and they are called either fontal, when fountains or rivers by the heat of the sun are dried, and converted to salt; or fluvial, when the arm of some river is condensed into salt; or stagnal, when ponds in the summer are dried, and a salt remains; or marine, when in the shore a certain tender salt is gotten, which *Dioscorides* calls *sal maris*: *Pliny* interprets it the spume of the sea; we call it the dry spume of the sea; or more rightly, a salt made by heat of the sea spume.

16. Facitious or cooked salt is made of water, and that either
Marine,

Marine, Fluvial, Fenny, Fountain, or of the water of Ponds.

17. Alome, by the definition of *Pliny*, is a certain salugo, or the salt sweat of the Earth, concreted of a muddy and slimy water.

18. And it is either clear, or black.

19. That which is clear, is judged the best; and it is either thick or liquid.

20. The liquid is soft, fat and clear.

21. The thick is either round or scissile, and it hath the form of Sugar.

22. The black is found in Cyprus, which purges Gold.

23. Bitumen is the juice of the Earth, gentle and tender, like to Pitch easily taking fire.

24. And it is either hard or soft.

25. The hard is strongly con-
creted,

creted, not unlike to the clods of the earth.

29. Of this sort are Asphaltus, Pissaphaltus and Amber.

27. Asphaltus is a blackish Bitumen, like to Pitch, but harder and more inspissated, splended, and less oleous; and this sort is gotten all over Babylon.

28. Pissaphaltus is a certain Bitumen, in a manner black, but of a more Terrene concretion.

29. Amber also is a Bitumen, and fat of the Earth, proceeding from the heat of the sea; and the colour is sometimes white, yellow or obscure.

30. The liquid Bitumen is that, which flows like an oleous liquor; of whose species are, Naptha and the Arabian Amber.

31. Naptha is liquid Bitumen, of an oleous crassitude: the fire hath such force over it, that it will leap into it, where ever it

is; neither can it be quenched by water, but the rather more inflamed by it.

32. That is called *Petreolum*, which flows from Rocks; and sometimes *Naptha Petra*.

33. Amber is fragrant Bitumen, and kept amongst the richest merchandise, and it is gotten about Arabia.

34. Vitriol is a concreted Juice, looking like the clearness of glass; it is called by the Latines *Atramentum sutorium*, and sometimes *Chalchanthum*.

35. The native is found concreted in the Veins of the Earth, or clefts of the Rock; and from thence doth distil by drops, part thereof hanging like frozen Ice, and part found in the bottom of Channels.

36. Furthermore, Juices which cannot be melted, yet not indurated into stones, are *Auripigmentum*,

tum, Sandarach, Chalk, Gypsum, Lime, Oker, Argil, Sealed earth, Armenian earth.

37. Antipigmentum, or Arsenick, is (B) a concreted Juice, of a yellowish colour, flourishing Pictures with a golden colour, is hot and dry, in the fourth degree, and a present poyson.

38. Sandarach is a reddish earth, of the colour of Cinabaris, yet something inclining to a yellow: much of it is gotten in the veins of Metals with Antipigmentum, smelling strong of Sulphure.

39. Lime is a dry earth, coated to a stone; which after it is burnt, is inflamed with water, and extinguished with oyl; it is called Viva or Living, because it contains fire hidden within it.

40. Gypsum is a shining earth, gentle and light, akin to Lime, but not so dry nor hot; which is dig-

digged out of the bottom of the earth : the *Factitious* is made of a certain stone, and so placed in walls, for the ornament of houses.

41. Chalk is a tender earth, and white, plentiful in the Island of Crete.

42. Ocher, is a light and yellowish earth, which when it is burnt is red.

43. Argil is a fat and soft earth, of which figuline vessels are made.

44. Sealed and Lemnian earth, is a portion of earth that is very red, digged out of the Island Lemnos, and sealed with the seal of *Diana's* high Priest; it is also digged daily in Silesia and Hafsia, it resists poyson.

45. The Armenian is a portion of earth, digged out in Armenia; drying by nature, and of a pale colour.

The

The Commentary.

(A) **S**alt is derived *a saliendo*, from leaping, because it leaps in the fire. Some judge it to be called salt from the sun, because it is gotten of its own accord of sea-water: the spume thereof, left upon the shore, by the sun, is concreted into salt. The efficient cause of salt, is the heat of the sun, and the rest of the stars; which drawing the sweeter and tender parts, out of the saltish matter, leaves the Terrene; which being boyled, makes a saltish substance. Two things are required to a salt sapour; the dry and Terrene parts, and their adustion: of the first is made a sapour, of the latter a salt sapour. Erroneous therefore is that opinion which judg'd salt to concreate, as Ice, of cold: For if salt doth

doth concrete of cold, it is dissolved with heat, because it is a general rule with Naturalists, every thing to be dissolved by the contrary, wherewith it was congealed; but salt is dissolved with nothing less then with heat, for that hardens it, and dryes it more; but it is quickly dissolved with water: therefore it is not constringed of cold. The matter is a Terrene Juice, adust, and dried with heat: the forme is dried vapours, with concocted water: the end and use of salt, is various in the whole course of life; whence it is rightly said, that nothing is more profitable, then salt and the sun. And old *Homer* called salt, Divine, because it is accommodated to various uses.

Salt hinders putrefaction, and takes away superfluous humidity in our Bodies: without salt, a perfect

fect concoction cannot be made: besides, it is of frequent use in the cure of wounds.

(B) Auripigmentum is double; native and factitious: that which is like to Ackorns, crupts of its own accord from Metals: this again is double; the one is made of Arsnick and natural salt, of equal parts mixed, and burned in a crucible till the vapour appear like Chrystal; hence it is called, Chrystalline Arsnick: the other is made of natural Arsnick and Sulphure mixed together, and combustible: both of them are dry and hot in the fourth degree, and a present poyson.

CHAP. 4.

*Of the Nature of Plants in general
and of their corruptions.*

1. **H**itherto we have spoken of an inanimate Body perfectly mixed. Now we pro-
ceed

ceed to **Animate Bodies**, which are perfectly mixed, endowed with soul and life.

2. There are two parts in the life of a furnished Body: the external Body, and the soul, which subministers life; of the former we have spoken before, of the latter we shall now.

3. An animate Body is expert of sense, or sensitive.

4. A **Plant** is a Body expert in sense, which is also called *stirps* (A) which is a body perfectly mixed, endowed with a vigent soul, which doth grow, live, wax green, is nourished and increased from the earth.

5. For when Plants are nourished and increased, and bear flowers and fruits; it proceeds from the soul, and they are the works of animated Bodies; neither can they be without this soul.

6. Therefore rejected is that opi-

opinion of the Philosophers, which call that the form, which vivifies Plants; and that their nature, which indeed is the soul.

7. And also Erroneous is that opinion, which maintains Plants to be Animals endowed with sense; which *Scaliger* refutes, *Exer.* 138.

8. For they are not accommodated with Organs, which are requisite to sensitive faculties; neither can the actions of any such faculties be apprehended in Plants: for which of them can see, hear, smell, taste, or feel. *Arist. lib. 1. de plant. C. 1.*

9. We do not deny, but some sense is resident in Plants, in attracting to them what is profitable, and shunning what is unprofitable; but then the question will be, how can Plants which are always fixed in a place, properly be said to draw what is profitable

fitable, and shun what is inconvenient, and shun what is inconvenient.

10. The vegetable soul alone that is within the Plant, is used as an instrument to the preservation of life, by heat, both native and adventitious, lawfully tempered, which the Plants draw out of the earth, where they are fixed by the roots.

11. That heat adhering in the moist matter, it attracts as convenient to its nature, and so alters and converts it into the substance of the Plant.

12. Hence there are two vital principles in every Plant; heat, and humour: the want whereof, as it is death to Animals, so it is a corruption and decaying to Plants.

13. Corruption doth either infect part of the Plant, or the whole.

14. A total corruption is either

ther natural or preternatural.

15. The natural is made, when Plants are rendered more dryer, for their internal heat, and their moisture, decayed by progress of time.

16. Some are corrupted sooner, others later; and so accordingly they live long or short.

17. The cause of which variety is especially the form, yet sometimes it happens from the plainness of the humour, and the plenty thereof; whereby the increase of heat, the instrument of form, is nourished, together with the firmness and solidity of the whole Plant.

18. For such grow a long time. As first, have much soft and gentle humidity in them; Secondly, a solid substance; Thirdly, their roots long and thick; Fourthly, those that are barren and fruitless; Fifthly, such as grow in a dry place.

19. On

19. On the contrary of these
those Plants are short lived, and
sooner perish by natural corrup-
tion, as have not the contraries
to the former.

20. Preternatural or violent cor-
ruption, happens either by ex-
tinction, or want of nourishment.

21. Corruption happening by
extinction, is when the Plant pe-
rishes by too much cold.

22. When cold is gotten to
the bottom, it hinders the warm
vapour, or heat, from coming to
the roots, and at length causes the
whole to perish.

23. This corruption doth not
happen, but when an extreme
cold comes and invades the roots,
denuded of earth.

24. Corruption happening
from want of nourishment, and
that by heat, by which the Plant
is as it were scorched, the humi-
dity thereof being (C) exhaus-

sted by the vehemency of heat.
 25. And there are two seasons
 especially, wherein Plants are ex-
 posed to this injury; the one
 when they begin to bud, because
 then they are more laxi the other
 when they bear fruit, when their
 juice is exhausted, and made
 weak.

26. That is called partial cor-
 ruption, or fideration, when the
 native heat of any part is extin-
 guished either by cold, or heat,
 or with a wound, mortification
 of that part following.

27. Furthermore, some kinde
 of Plants grow of their own ac-
 cord, and some are propagated
 by the art and industry of man.

28. Such arise of their own
 accord, of seed, as are either ma-
 nifest or obscure.

29. Those that grow of manifest
 seed, have but one manner of ri-
 sing; as in all Herbarous Plants,
 that

that are sown of seed; and others are propagated divers manner of ways.

30. From manifest seed, after this manner: seed falling into the moist earth is thereby softened, and is cherished both with natural and celestial heat; and for swelling, by reason of the plenty of humour flowing into them from the earth, it breaks; and out of that part which is broken, a certain soft and tender sprout doth grow, & by so little becomes more firm and crass; one part whereof, being partaker of the airy nature, ascends up; the other, which is terrestrial and crass, resides in the earth, and there coalesces.

31. So then, Plants arising from seed, are cherished by the humour of the earth, delighted by heat, and attracted by their internal nature.

22. But the time of sprouting of Plants, is not one and the same, (D) for some do begin to grow within three days, as the Basil and Rape; some on the fourth day, as Lettice; some on the fifth, as the Gourd; some on the sixth, as Beet; some on the eighth, as Arach; some on the tenth, as Colwort: Leeks in twenty days; Smallidg forty or fifty: Last of all, Pyony and Mandrake, scarce in the space of a whole year.

23. The causes of this diversity of sproutings, are these: First, the strength of Form; Secondly, the strength or weakness of their inward heat; Thirdly, the variety or density, fatness or hardness of the seeds; for in hard and dense Bodies, the humour cannot be elicited out of the earth so readily, whereby seed must swell before it erupts.

34. Certain Plants, (E.) according to the opinion of *Theophrastus*, are said to grow without evident or manifest seed: and he declares the cause to be, a certain permission of earth and putrefied water, which being, as it were, preserved both by the heat of the sun, and the propriety of the matter, renders a fit generation of spontaneous Plants.

35. This opinion is probable enough; for as a strange heat is the cause of putrefaction, so also into things of new forms, which are putrefied; and he makes the heat of the sun and stars, to be a beneficial induction thereunto.

36. But besides these, the air and the earth may be the cause of sproutings of such Plants as grow spontaneously; If it be true, that according to the various situation of first and second qualities in substance, various

mutations and generations of things may be made.

37. Moreover, a Plant sometimes is produced out of a hard stone; which happens, when air is included therein, and endeavors to ascend; but when it cannot finde a passage, it is reflected, and so waxes hot by its agitation, whereby it draws the humor of the stone to it self. That vapour with the humour, breaks out, and of that vapour and humour brought out of the stone, a Plant is ingendered by the concurrent heat of the sun, *Arist. lib. 2. de Plantis, c. 5.*

38. Furthermore, Plants are variously propagated by the art and industry of men, by setting of roots, or ingrafting yong slips.

39. By setting of roots, as Liquorice, Lilly: for these do easily attract aliment, and so live.

40. By ingrafting or planting,
and

and that either by fastning them in the earth, or upon the stock of a tree.

41. Planted or fixed in the earth, as the Rose, Willow, Vine, Mulberry; which is called a propagation.

42. Engrafted upon the stock of a tree, by thrusting a slip into the wood of another; which properly indeed is called insition; as an Apple-tree into a Pear-tree.

43. Indeed most Plants may be propagated all these ways; as Olives, Figgs, and Cherry-trees.

44. But there are invented other manner of propagations, more artificially, whereby a leaf digged out of the earth to bud in a new stock.

45. But it is a question not to be contemned, (F) why the dissected parts of Plants, do live, and thereby propagated, when it

is the cause of death in Animals? This is said to happen, because Plants have the strength and force of the soul engrafted within them, and so diffused over all their parts. Heat also, which is an individual companion of the soul, and moisture gentle and thin, and therefore not dissipable; but it is not so with Animals, for they stand in need of that faculty, which flows from the heart.

46. Therefore part of a bough, which is planted in the earth, doth preserve in it self heat, humour, and strength of the soul; and by that attracted humour, begins to swell and receive spirit, and by the strength of the soul, it detaines, and by the help of its innate heat, it distributes the grossest parts of the humour, from whence the roots are framed; and the thinnest part it preserves,

serves, which causes it to grow higher.

47. The same manner is observed in engrafting; for as Plants out of the earth, as out of a womb; so Grafts from those where they are grafted, do preserve, keep, and attract the nutriment of the Plant, by the force of the soul and heat; and by a continued action, a generation of parts is made.

48. But Aliment, which the Graft draws, is by far more elaborate: First, in that was concocted before in the mother; Secondly, in that is made more exact, in its new guest.

39. Hence it is that wilde Plants, if they be engrafted, do remain firm, because they are nourished by a more sweet Aliment; so that a Domestick or Garden Plant, engrafted into a wilde Plant, will grow better, and

and yield more pleasanter fruit,

50. The Fruits of these respond in sapour, colour, and odour: the nature of the Plant, whence the Graft was taken, because the juice whereby the fruit is nourished, is of great moment in this matter.

The Commentary.

(A) **N**ature doth proceed always from the less perfect, to the more perfect; therefore it is in the first place disputed, seeing that Plants, by reason of forms, do want of the perfection of Animals, whether it be a body perfectly mixed; First, it is defined to be a Body perfectly mixed, to difference it from Meteors, in which there is an alteration of Elements made; whereas in Plants, and also in Metals, there is a notable mutation of elements.

elementary parts; therefore there is added in the definition, *endowed with a vegetive soul*. Therefore in the first place, that I may take away the opinion, both of Philosophers and Physicians, who call that the form which governs the Plant, and that the nature which is the soul; for when Plants are nourished and increase, they bear fruits and flowers, which are the works of animate Bodies; and they cannot want that soul: Secondly, to take away their opinion, who declare, that Plants are endowed with sense, as Animals are; concerning which, *Plato, Anaxagoras, Empedocles*, and many others maintain, to which many later writers assent, but especially *Cardan*.

First, Flight, Hatred, Aversion, Appetite, cannot be attributed to any Bodies, but such as are en-

endowed with a sensitive soul; but Plants refuse and fly too much: Heat (as the Vine hath no propinquity with the Cabbage) and many other Plants also (the Vine desires the Elm, and almost all other Plants do gather what is familiar unto them, and fly from what is unprofitable) therefore by these actions, it is not obscure that Plants are endowed with sense.

Secondly, they are distinguished in the sex; the Feminine Plant cannot consist with the Masculine, each other desiring their congress; neither can they come to ripeness, or bear fruit, without their mutual society.

But to the first we Answer, That the Hatred, Flight, and Appetite of Plants, is not proper, but translated, as *Durres* speaks: indeed they contract and extend themselves by the benefit
of

of their Fibres, and so receive what is familiar and profitable, by a certain natural faculty; yet not with any sense, only endowed with the strength of a vegetive soul, and led by the impulse of nature, which *Cicero* calls an instinct; for what things love or hate by sense, those cannot hate or love, as *Scaliger* saith, *Exer.* 138.

But for example, the Cabbage always refuses the Vine, and hath a continual enmity against it; and hence doth manifestly evade it: But this Flight and Appetite of Plants, is altogether without sense; yet some attribute this to the Sex of the Plants, which is to be understood metaphorically, as a certain similitude taken from strength and weakness: for the Masculine is more stronger than the Feminine, the Feminine more weaker than the Masculine;

line; therefore we are to understand, that masculine Plants are always strong, and robust, the feminine weak and fecundine.

But it is said in the Definition, *which do grow out of the earth*, for this is, as it were, the belly of Plants, as *Anaxagoras* saith; and out of this the Fibres of the roots, whatsoever is profitable to them and agreeable to their nature, they attract, and convert into their substance. Further, it is said to grow, live, nourish, and increase; in which vital actions, the Plant differs from other Inanimate things; which as they are destitute of a soul, so they want these actions: Hence it is, that a Plant is said to be dissolved, not that it hath onely an animate Body, but organical also; and so of it self alone, and not of the earth, as the *Soicks* would have it, to have the beginning of its actions:
but

but although these strengths and actions are common to Animals; yet notwithstanding they are insited in Plants, the soul is used to the life and preservation of the Plants, instrumentally, with heat well tempered, which Plants do draw out of the earth, where they are placed by the roots; and that heat which cleaves to the humid tressel and subject; the defect whereof as it is death to Animals; so it is dryness and corruption to Plants.

(B) The plenty of the inward humour, causes the longevity of Plants; for thereby the innate heat, which is the instrument of form, is thereby made: First therefore, when plenty of heat is discerned; it suggests the aliment not easily to be dissipated: but that the Plant will live long, and yield much oleous and resinous juice: Secondly, when they are
dense

dense and compact, they faithfully preserve their vital heat and moisture, neither can they suffer external injuries; and for this cause, trees are more diuturnal then Fruits, and Fruits then Herbs. Thirdly, the Longitude and crassitude of roots is of great moment, by reason of their hardness, for lengthening of life: First, because by how much the roots are deeper, by so much they stick more firm, and the more do resist the external injury of winde and heat: Secondly, the roots are, as it were, the beginning of Plants, in which the hot moisture doth chiefly flourish, and the subterranean heat and humour daily cherished: for it is consonant to reason, where there is much humidity and calidity, there the roots must needs be ample and profound; and therefore a small and simple root, is defective of calidity

calidity and humidity, and there-
upon cannot grow long. Fourth-
ly, fecundity also is the cause of
shortning its life, because of the
too little dissipation of Juice,
whereby the inward humour is
nourished; which juice should go
into the seed and fruit.

(C) Heat hurts Plants less
then cold, unless aridity accede,
which is called *squalor*; and those
are easily hurt by cold, whose
roots are not deep, for there the
sun doth the sooner pierce unto
them; and the proximate parts
of the roots, are affected strongly
by the beams of the sun, because
the earth is wanting to nourish
them.

(D) But why certain Plants
do arise quickly after sowing the
seed, and others a long time af-
ter; The first and chiefest cause,
is the force of form; The second
is the strength and imbecility of
the

the insited heat ; The third is the rarity and density , the softness and hardness of the seeds : for in hard and dense Bodies , the humour is elicited , not so readily by the force of heat out of the earth , whereby the seed doth swell : and for this cause it is , that the seed of Pyony doth bud so long after Sation , and Mandrake longer : which is more hard and dense , which certain space of days of budding , or sprouting happens according to the variety of the suns influence , and heavens concurrence : and hence it is , that if dung be commixed with the earth where seed is to be sown , the seed will sooner erupt , not onely excited thereunto by the innate heat of the seed , as the extream calidity of the earth ; so the seeds of Palmes , if infused and macerated in water , before its sation , it sooner sprouts.

(E) *Theophrastus* saith, that experience teaches, that certain Plants do grow without seed, and that some have been seen to grow in the earth, where none was sown or planted before: he instances in *Laserpitium*, which sometimes hath been seen in *Africa*, and never found before, in the same place. Some of the Philosophers do inquire out the seminal cause of these Plants. *Anaxagoras* judges the air to convey the seed from some other place, and there to fix according to the course of nature; others judge it to happen by the inundation, and conflux of waters, whereby seeds are conveyed from some places to other parts of the earth more remote. And although these things are not spoken altogether foolishly, as without reason, yet the truth thereof is to be questioned; but it is certain

tain that many Plants, however, have been found to grow of their own accord, without any seed; As *Polypody* of the Oak: as we see certain little Animals to have their original by accidents, as lice, worms, and other insects that are generated by accidents.

(F) It is a question deserves solution, whence it is that the infected parts of Plants do live longer, then if they had remained whole, nay and are thereby propogated; whereas it is not so with Animals; for if their parts be cut, they perish: For we see that boughs plucked from their stock, and plants plucked up by the roots, to grow and are thereby propagated; but with Animals, after the division of a foot, ear, arm, leg, or ther parts, forthwith they die. I answer, that Plants do longer survive after their section, if again planted or

engrafted, because they have the force of the soul insited, and that diffused through all and every part: And besides, they have scattered abroad their native heat, the individual companion of the soul; and their humidity, which is lent and crass: and therefore less dissippable through all the parts; by which two principles they live, and undergo all the functions of nature: and hence it is, that part of a Plant sejoyned from its stock, is said to live in the earth (the matrix as it were of Plants) by the benefit of the soul, which is *correlative* in the whole, and every part; and to beget a root, or take rooting (which is a new principle) from the humidity resident and attracted out of the earth; or sprout and grow out of another trunk planted therein by insition, and so coalesce after the

the same manner even now declared.

For as long as Plants preserve that humidity of theirs, steadfast and dense, so long are they capable of life and soul: but such as are perfect Animals, and are consequently of a stronger and better nature, do not onely stand in need of an insited, but an influent faculty, which is drawn from the heart: and hence it is, that their humidity is not so steadfast, viz. substantial, but more thin and tenderer, and therefore doth the sooner expire. Hence it is, that if a hand be separated from the body, all the life therein is extinguished, because it is destitute of an influent faculty from the heart; for that thing cannot have a soul, unless it have a continued derivation from the heart; which if it once be destitute of, it loses to be an animated being.

Chap.

C H A P. 5.

Of certain affections of Plants.

1. **H**itherto we have Treated of the rise of Plants, both Natural and Artificial. Now we shall proceed to their Affections or Corruptions, wherewith they are infested: their Affections may proceed, either from their native soyl, or rather the ground where planted: from the variety of their germination, fecundity, and propriety of substance; or from their qualities.

2. The soyl or rather matter of the rise of Plants, is either Terrestrial or Aquatical.

3. Terrestrial, viz. their native place in the earth, and that either in gardens or fields, sative or wilde.

G 4. The

4. The Sative are Domestick Plants, such as grow in Gardens.

5. The Wilde, are such as grow in the Woods, Mountains, Valleys, and the like.

6. Aquatical, such as grow in waters, and that either in the ocean or lesser waters, as in Fountains, Rivers, Ponds, &c. *Arist.*

7. Again, some Plants are delighted in a hot place, some in a cold place; some in the open field, some in the shade; some upon rocks, and some upon sandy-ground.

8. But why (A) Plants should delight to grow in such variety of soyls, is not easily determined; yet notwithstanding the place where the thing is fited, is the conservation of that thing, and indeed of all things sublu-
nar: therefore divers Plants are of divers natures, and accordingly do attract convenient Aliment
out

out of that soyl, for the preservation of life; and do therefore rejoyce, as it were, in a fit and convenient soyl.

9. Furthermore, notice must be taken in the germination of Plants, the time when they germinate, their Celerity and Tardity.

10. The time of germination is the Spring, when there is plenty of humour abounding, which was gathered in the winter-season; and then their innate heat is excited by the extremity of external heat, insomuch that the *cutis* of Plants, and the *meatus* of the universal Body, begins to be opened, which causes the juice to be educed abroad, and a budding or germination to be made.

11. Others put forth their summer-fruit sooner or later, according to their nature; which happens according to the greater

ter or lesser force of the innate heat and humour, and also the rarity or density of the Plants body.

12. Sometimes, notwithstanding, tilled or pruned Plants do bud later then the untilled: First, by reason of the less revocation of the inward heat to the outward parts, and by reason of the wounds made by pruning: Secondly, either from the debilitation or weakness of the same heat, or the denudation of the root, or from the incraffitude of the humour: Thirdly, from the density and thickness of the Plant, induced or brought into the root by the force of nocturnal frigidity, and by the root into the whole Plant.

17. And they do not generate forthwith, in their first age (neither do Animals, whilst young and tender, bear young) because
all

all their aliment at that time, is diverted into their increment: Secondly, their force is more weak, whereby it cannot concoct it, nor condensate it into fruit.

14 Neither do all Plants generate; for so some are fruitful, others not fruitful.

15. The cause of fruitfulness, is referred by some onely to heat; but when there is heat without matter, that is, copious aliment, it can effect or frame nothing. Hot and succulent Plants are onely fruitful.

16. Of fruitful or fecundine Plants, some do bear fruit once in all their life, others oftner.

17. Those that bear fruit oftner, are such as fructicate annually once a year, some twice, and some three times a year: the proximate cause of which, is no other then the proximate form of every species.

18. Of fecundine Plants, some are fertile continually, and that by the reason of the abundance of their heat, and fatness of their humour: as the Fig-tree, which fructicates sometimes but every year; the same is observed in Pear-trees and Apple-trees.

19. These Trees are very profuse, for they require so much aliment for the generation of fruit, that if they receive not annually so much, by reason of the season of the year, they become barren for that year.

20. The property of the substance of Plants may be discerned, by their various affections, whereby they exercise and act.

21. Plants exercise their strength in things that are either Animate, or Inanimate.

22. Inanimate things; as upon other Plants, or Animals.

23. Upon Plants, they either exer-

exercise a sympathy or antipathy, friendship or enmity; so that the Olive-tree will be averse to the Oak, the Cabadge to the Vine, the Reed to the Fearn: but on the contrary, there is a friendship & sympathy between Rue and the Fig-tree; that each other profits much by their vicinity.

24. The inquisition of these things is so obscure, insomuch that some have referred their original to an occult cause, and others have gone about to demonstrate it by reason.

25. But however, this is most likely the true meaning why they prosecute such a sympathy and antipathy, by reason of the subtraction of aliment and corruption: for this cause it is, that where the Oak is, the Olive will not live, because the aliment is corrupted by the dryness

of the Oak, and therefore is made more arid then the nature of Olive is. So the Cabbage and the Vine cannot grow together: First, because the roots of the Vine do draw abundance of aliment from all the parts of the ground where it is planted: Secondly, because the bushiness of the Vine obstructs the reflection of the sun upon the Cabbage.

26. So in like manner do they exercise sympathy and friendship: the Rue seems to have nutriment with the Fig-tree, which is the cause of this loving correspondence; for if the nature of the Fig-tree be hot, it must needs attract hot nutriment, which corresponds with the nature of Rue.

27. Plants also have a sympathy and antipathy to Animals, and that either to man alone, or other Animals.

28. Some Plants are friendly
to

to mankind, others are adverse to humane nature, and others do partake of a certain medium between both.

29. Those that are friendly, do repair and defend the universal Body, or determinated parts.

30. Those which are said to preserve the life of the universal Body, are such as have a strong faculty in nourishing, whose is the consent of principles, if so be all things be nourished with its like.

31. But whether this consent happens from the form, or rather matter, is an intricate doubt. Indeed the hability of the matter is altogether necessary, but the consent of the form ought to accede.

32. And these Plants do nourish either in the whole, or in part.

33. Whole Plants that do nourish, are such as these: pot-herbs,

herbs, Lettice, Cabbage, Water-creffes, Brooklime.

34. Part of Plants; as the roots of Rape, Parsnip, Radish: fruits; as of Mellons, Cucumbers: seeds; as of Beans and Pease: corn; as of Barley, Wheat, Rye, &c.

35. What things do defend a certain part of the body, are various: as Pyony the head, Saffron the heart, Mint the stomach, Egrimony the liver, Capers the spleen, Hermōdactyls the arteries; the cause of which is a certain similitude and consent of that Plant, with the form of that part to which ordained.

36. Some Plants are enemies, pernicious and hurtful, and that either to the whole body, or part: to the whole they prove fatal, by everting the continuity of union, and depraving of life, or stupefie or benum part of the body: as
Hen-

Henbane to the head, Pepper of the Mount to the liver, Ervus to the reins and bladder, Aloes to the hemorrhoids; the cause of which antipathy or corruption, is the controversie of the form.

37. One and the same Plant, is sometimes salutary to one man, but noxious and death to another, by reason of the peculiar constitution of the *individuum*.

38. Some Plants there are, partly friends, and partly enemies to our bodies, partaking of a middle nature between sympathy and antipathy.

39. They are enemies indeed, which are infested with a bad sapour or odour; they are friends that are correspondent to our constitution, which do bring out unprofitable juices out of our Bodies; as Coloquintida and other purging Plants.

40. But as far as Medicaments

ments act by purgation, so far they operate upon nature, by a certain force, which may be accounted under the name of being an enemy to nature: and those which draw corruption with humours, are enemies, though they be judged to draw them by a certain similitude and congruity.

41. The strength of Plants have also a certain friendship and enmity with other Animals: for Fennel is a friend to the Serpent, but Rue an enemy; the Ash to the Scorpion, but Wolfsbane infests him, & white Hellebore is a friend to him; for if he be laid thereto, he revives: so Basil, in which he hath been seen to ingender: so the herbs Oenothera, Crateva, Lyfimachus, hung about the necks of mad Animals, or untamed Bulls, they will cause them (as Antiquity hath

hath observed) to turn round : all which do expresse necessarily a certain tacite consent of forms.

42. Plants also do produce various effects in inanimite things ; for the ancients have left upon record, that by the force and touch of Mistletoe, and the herb *Æthiopis*, all Locks and Bolts do fly open : The Spina of *Theophrastus* doth congeal water : Radix, *Hybisci*, and the juice of Purslain and Mercury, doth abate the force of fire (this hath often been experimented in our time) all which in reason we ought to believe to be acted no other ways, then by the power of proper forms.

43. Lastly, for the nourishment and contemperation of the elementary qualities in Plants, four degrees are constituted in Plants, to wit, that some be hot or cold, moist or dry, in the first

H

or

or second, third or fourth degree.

44. And these degrees respectively taken, are either remiss or intense: those that are remiss, are such as are placed in the first degree; the rest are intense, so that the fourth be the chief, and exceed altogether mediocrity.

The Commentary.

(A) **VV** Hy Plants are delighted to grow in various places, is a thing not easily unfolded; yet it is a thing worth inquiring.

Therefore according to the opinion of the Philosophers, the place is the conservator of all things; that as the nature of Plants is various, so they have need of divers places to preserve life: therefore that place alone, or soyl, is proper and profitable to
the

(III)

the life of Plants, which doth suggest convenient aliment unto them, and in which the roots of the Plant may have foundation commodious for its nature: on the contrary, that place is altogether unprofitable for Plants, where moderate aliment is not afforded in plenty, according to the nature of the Plant and its substance, in the first and second qualities; or where the soyl is such, that the roots can neither go lower, nor rise higher, as occasion serves and need requires: therefore these Plants, which stand in need of pure aliment, much and sweet, can never profit or thrive, where the place suggests nothing but impure, little, hot, and saltish aliment: so such as have robust and long roots, will not live in a dense soyl; and those that have small and tender roots, cannot thrive in a thin soyl,

because they cannot draw aliment from the bottom. Some are bettered with a dense air; which happens, because of their dissipation by the airs tenuity: some thrive gallantly in a sunny place, because they stand in need of the heat of the sun, to excite their denser substance: and here also is a certain tacite consent proceeding from the peculiar form of Plants: for in cold places hot juyce doth grow; and in a cold and moist place, sometimes hot and dry Plants do live.

C H A P. 6.

Of the parts of Plants, and their kinds.

1. **H**itherto of Plants which have a body both organical and animate. Now of their parts.

2. What-

2. Whatsoever that is from which the body of Plants is constituted, is either within the ground, and then it is called a root; or above the ground, then superficies.

3. And this whole body is distributed into parts; or principals, or less principal.

4. Those which are called the true principals, are those parts in which the vegetable soul doth perfect nutrition, and conserve life.

5. And they are either similar, or dissimilar.

6. Similar parts, which have one and the same substance altogether: and because many of them want proper words, they change the appellation of parts of **Animals**, by a certain Analogy.

7. And these are either liquid, or solid.

8. The

8. The liquid are Juices and Tears.

9. Juice is that liquid part, diffused in the substances of Plants; by which, as with blood, their life is preserved, *Arist. 1. de Plant. c. 2.*

10. *Lachryma*, or Tears, are humours which drop from Plants spontaneously; either induced thereunto by the heat of the sun, or the plenty of humour dehiscing upon any occasion.

11. And they are either watry, as such as do concrete into Gums; or pitchy, such as are converted to Rosin.

12. The solid parts are the substance, called flesh and the fibres.

13. The Flesh is the gross substance of the Plant, consisting of a concreted humour, responding to the muscles of Animals.

14. The Fibres are long parts, continued & fissile, carried in the same

same manner over the whole Plant, as Veins and Nerves in Animals; and accordingly in Plants, they are called Veins and Nerves: the succulent Fibres, are the greater Veins; the dry, the lesser.

15. The dissimilar parts do consist of the similar.

16 And these are either universal or anniversary.

17. The Universal, or parts during for a long time, are the root, the caule, matrix, and bough.

18. The root is the lowest part of the Plant, which is as it were the mouth of the Plant, fixed in the earth; thereby attracting nutriment for the enlivening of the whole, and the supplying of every part.

19. The caule is the Trunk, Stock, or Body of the Plant, which doth arise next from the
root

root above the earth ; into which, as it were into the *vena cava*, the aliment doth first ascend from the root, and after a full concoction, is carried to the other parts.

20. The matrix, or medulla, or sap, is the internal part of the Plant ; lying hid in the middle of the Plant, consisting of flesh and humour.

21. The boughs are parts of the Plant which do stretch out and dilate themselves from the caule or trunk, as the arms of the body from the shoulders.

22. Anniversary, that is, those parts that grow afresh yearly, young twigs, flowers and fruit.

23. A twig is part of the Plant which arises new from the boughs yearly ; and upon these twigs, do the fruit and flowers hang.

24. The less principal parts
are

are the Barks and Leaves.

25. The Bark is, as it were, a certain tunicle made of Fibres, wherewith the body is involved; and is called the rinde.

26. Leaves are, as it were, the excrements of Plants; and they do consist of humour and fibres.

27. But Plants are either perfect or imperfect.

28. I call those perfect, which evidently have the first and principal parts of Plants, to wit, the superficies and the root.

29. And these have by nature, for their superficies, a caul, or none.

30. Those that have a caule, have it either perpetual, that is to say, for a long time, or not perpetual.

31. Those whose caules are not perpetual, they have no liqueous substance, as all kindes of herbs; and these amongst all Plants, are the least.

32. An

32. An herb (A) therefore is a little Plant, whose superficies consists of a caule or stem, void of wood, continuing for a year.

33. Under this we comprehend all fruits and pot-herbs, which are no other then such as are fit to be eaten.

34. Those which have a caule perpetual, that is, for a long time, have it either by nature simple or compound, one or more.

35. Those which have it simple, are Plants of the greatest crassitude, as trees.

36. A tree therefore is a liqueous Plant, hard to be dissolved; amongst all Plants, the firmest and highest, whose candel is perpetual, and by nature simple.

37. And this hath either a firm caul, or not firm.

38. Firm, as the Oak, the Apple-tree, Pear, and Cherry-tree, &c.

39. Infirm, as the Vine and others, which are said to be supported.

40. Which have many caules, and the same either thin or crass.

41. Those which have a thin caule, are reckoned amongst less liqueous Plants, as Broom and Ravine.

42. Brush or Ravine is a Plant accounted the least amongst liqueous Plants, both in altitude and crassitude, not unlike to the Rose-tree, Sage, and Marshmallow.

43. Those which have crass caules, are reckoned amongst middle Plants, easily passing into the nature of trees, by the abscission of the unprofitable branches, as shrubs.

44. A shrub is a liqueous Plant, of a middle altitude and crassitude, who hath for its superficies a perpetual caule, by nature

nature multifarious and crass ; as the Hazle and Elder.

45. Imperfect Plants are those which want a superficies and root , or that is obscurely in them, or not in them.

45. Of this sort are Mushrooms and Toadstools, whose substance is spongy, in which but one superficies can be discerned; so also Mistletoe, Dodder, and Epithimus, in which no root can be seen.

47. There are so many varieties of Plants in the universe, that they cannot be comprehended within our brevity; their species and several natures may be known, by reading of *Pliny*, *Theophrastus*, and other writers of Herbs.

The Commentary.

(A) **A**N Herb may be distinguished several ways by divers Arguments : we shall only distinguish of those which are idoncous to be eaten ; of which sort are edible Fruits and Herbs : Fruits ; as Wheat, Rye, Barley, Oats, &c. all manner of pulse ; as Pease, &c. Pot-herbs ; as Radish, Fennel, &c. and all other Herbs that are eaten or mingled with meats ; as the Cabbage, Lettice, &c. Those which are not fit for esure, are healthful or exitial ; the use whereof is in medicine, either to absterge, calefie, or refrigerate ; with many other properties, which medicine requires : exitial are those that have an excedent quality, as Hemlock.

But why have Plants and Animals

mals such a familiarity or hatred amongst themselves, is a question worth resolving.

There are certain Herbs which are edible, which preserve the life of Animals: now the consent must be in principles; for all things are nourished by their simile, and corrupted by their contrary: but whether this consent be from the form or matter, is a question not yet resolved. That it doth proceed from the matter, is a thing seemingly to be proved, because the aliment doth not come from the naked form, but body of the Plants; and when it begins to nourish (for those aliments which nourish, must be concocted by the innate heat of the Animal, and so be changed divers manner of ways) it seems rather to belong to the matter, then the form: but we must know that matter cannot be idoneous for

for the nourishment of any body; unless also the consent of form doth concur; for neither without the help of other, can be the cause of any action. For whatsoever is made from a body that doth consist of matter and form, is so made, that the actions may be given rather to the form than matter, and the passions rather to the matter than form: and therefore the familiarity of nutriment, is chiefly to be referred to the form, although the concurrence of the hability of the matter, be necessary. From these may be gathered, why certain herbs are so averse from putrefaction; but on the contrary, apt and ready to the breaking of the whole body, and everting of life: for the cause of corruption is the contrariety of form; and the matter makes repugnancy, lest that any nutriment happen to

the other : for so the seeds of Grapes have of the matter, and yet not nourish men ; and the wolf *Thos* hath of form and matter, and yet averse from the life of men.

CHAP. 7.

Of parts contained in animate Bodies ; and first of all, of Humors.

1. **H**itherto we have spoken of the first kinde of natural Animates, to wit, of Plants : We shall now prosecute the other kinde, *aistheton*, or such as have sense.

2. *Aisthetice* is a nature which is indowed with sense.

3. And it is *Zoophyton*, or an Animal.

4. An Animal is a (A) sensible and animated body, moving

ving it self to a place.

5. For Sense belongs onely to Animals, and they are constituted for them; and herein they differ from Plants.

6. This animated Body (B) is one, and simple harmony of many parts, by continuation and union of form; and it is dividu-
al and variable into almost infinite parts.

7. Therefore all that is part of an animate Body, into which the same body cannot be divided, or remain well whole, *Arist. 7. Polit. c. 8.*

8. And some things are contained in these parts.

9. They are contained, which when they have a fluent and coherent nature, are yet sustained by help of others.

10. Of which sort (C) are both humours and spirits.

11. An humour is the liquid
I 3 and

and fluent part of a body, contained in the spaces of an animate body, and so placed therefore for the preservation of the same.

12. Therefore whatsoever doth flow in and from the body, inso-much that a vessel is required to be subjected, in which the thing may be contained, is called an humour.

13. And humour is either *insite* or *acquisite*: the *insite* is engendered of the whole mass of the body, having its rise from the seed and menstruous blood, for the conformation of the body; and it is also called radical, or primogenial.

14. And it is either airy, or oleous, in which the native heat is preserved, even as a flame by the candle.

15. It is daily made of aliment: for whatsoever suffices in
its

its place, it is needful to be changed by the help of heat; but heat in product of time begins to fade, and therefore what happens of aliment, is impure; and if it be destitute of fit aliment, then heat at length quite dissipates.

16. The acquiste doth come out for reparation sake, for the more profitable parts of aliments.

17. And it is either primary or secondary.

18. The primary is gotten immediately of aliments concocted in the liver.

19. Chylus therefore is not to be accounted the first humour, both for that it is unapt of it self to nourish the body or any part thereof, and also that it is not as yet truly fluid, and not cocted in the liver.

20. Primary humours are either profitable or excrementitious.

21. Those that are profitable, and make much to nutrition, are blood and flegme.

22. Blood (D) is a hot humour, temperate, sweet, rubicund, prepared in the Miseraick veins, and conected in the liver, of the most temperate, oleous and airy parts of chyle.

23. With this alone, are all the parts of animals nourished. First, when it is certain, that we are nourished of those things of which we consist; but we are made of pure blood in the womb. Secondly, because this humour alone is distributed by vessels, over the whole body, and so doth accede to every part. Thirdly, this alone also is sweet, and apt to nourish: other humours are either bitter or acid. Fourthly, this alone can concrete by the benefit of the fibres, and be assimilated to the body, *Arist. l. 2. de part. anim. c. 23.*

24. There-

24. Therefore this alone is contained in the veins, not mingled with any other humour, although it be conflated of four divers parts, which do so constitute the sanguineous Mass, as Cheese and Whay belongs to the substance of milk.

25. Therefore, because nature is not one and the same in all parts, therefore from this Mass several stocks of juices may be drawn.

26. Those parts are various, of which blood doth consist: some improperly entitle them by the name of excrementitious humours.

27. For those humours are not carried with blood into the body, if it injoys fully its native health; but if infested with any preternatural affection, then it is not blood, but an excrement, as *Aristotle* calls it; and the Philosophers,

phers, *Nosodes haima*, diseased blood.

28. Flegme (E) is a cold humour, moist, white, and insipid; gotten of a cold portion of chyle in the liver, that by the progress of time and greater concoction, it may divert to blood, and so nourish the body.

29. Therefore, nature prudently hath hid no receptacle, which might expurge it: therefore, seeing it cannot be evacuated, it requires to be altered.

30. Furthermore, there are excrementitious humours, which are unprofitable to nourish the body; therefore they are purged by nature.

31. And these are made either by the second concoction, together with the blood in the liver, and may be discerned; or of the third, of what is left of every part.

32. Two excrementitious humours,

mors are generated in the second concoction in the liver: the one representing the flower, the other the fecies of wine, to wit, yellow and black, choler and whey.

33. Yellow bile or choler (F) is an excrementitious humour, hot and dry, bitter also, being procreated of the tender and hotter parts of chyle; and so gathered into the bladder of the gall.

34. This humor doth flow from the bladder of the gall, by the passage of the Choledochum (from *χολη*, that is, choler, and *δεχομαι*, that is to receive) to the end of the intestines, that it may stimulate the dull intestines by its acrimony to excretion; and so bring down the slow flegme adhering to the interior membranes.

35. Black choler (G) or melancholy is a cold and dry humour, crass, and black, acerb,
acid,

acid, arising from the grosser and feculent part of aliment, and expurged from the spleen.

36. *Serum* or whey, is an excrementitious humor, begotten of drink or any other liquor, wherewith meat is digested in the stomach by the action of heat in the liver.

37. Part of it is mild, and distributed together with blood into the veins, and so the same made gross by the coction, and plenty of fibres; and as it were deduced in a chariot, to the extremities of the body: the other part which is unprofitable, is forthwith expelled to the reins; and hence by the Uretra's to the bladder.

38. This *Serum*, therefore, is matter of urine; for this is no other thing then *serum*, altered in the liver and vessels, attracted from the reins, and expelled into the

the bladder : and at last excreted by the passage of the vein, that purer blood may be made.

39. But the excrementitious humours, which are discerned in the third concoction, do either break out of the whole body, or by some determinate part.

40. Of which sort are sweats, and tears, which we put amongst the excrements of the third concoction : not that they are then generated (for their matter is the same with *serum*) but after that the concoction is made, they are discerned.

41. Sweat therefore is *serum* altered in the liver, and by the conveyance of the blood, is transmitted by the veins; and at length out of these veins, by the insensible passages of the body, expelled into the species of water.

42. The usual and natural sweat

sweat of our body is of a watry colour ; but sometimes it is yellowish , and reddish , by reason of the tenuity of the blood, which *Aristotle* mentions.

43. A Tear is a drop, contained in the head and angles of the veins which are in the eyes, and doth break out by the watry holes, to the internal angle of the eye ; and by compression and dilatation , by the scissure of the conjunctive tunicle.

44. Hence it is, that the coming of tears , doth not proceed from the eyes ; for they are , as it were, but the emissaries of the drops.

45. It behoves also that nature should have given to every man tears, properly so called, because sometimes he is sad , and sometimes rejoyces ; whence his veins are dilated and compressed.

46. They are most prone to tears,

tears, whose bodies are endowed with a cold and moist, tender, soft, and effeminate constitution, and with a moist and languid brain: hence it is, that children and women, more then men, are addicted more to pour out tears in such a plentiful manner.

47. Great plenty and abundance of tears do flow from them also, who have the caruncles and angles of the eyes great and lax.

48. And on the contrary, some by no force, nor means, can be made to weep, because in them the Lachrymal flesh doth obduce the veins, and so hinder the flux of tears.

49. Let these suffice to have been spoken of the primary humours, both excrementitious and profitable: the secondary humours, are those which are made new, of insited or radical moisture,

sture, or of blood much concocted.

50. Of which sort are these two, (H) Ros and Gluten.

51. Ros is an humour, which doth distil like a dew, generated of blood resolved into vapour, and doth resude by the tunicles of the veins; and partly flows from or by the pores thereof.

52. Gluten is an humour begotten of Ros: applied first to the substance of the part, and there adhering; and then changed by the heat of the parts: and it is called Gluten, because it agglutinates the parts.

53. Therefore we shall exclude the rest; either because they are or may be referred to what hath been said; or that they are improper, wanting names, whereby they cannot be appropriated to any class.

The Commentary.

(A) **I**T is delivered in the definition, that an Animal doth consist of Matter and Form. Matter is an Animate, or Organical body : Form is endowed with sense ; for sense ought to belong, and is necessary to such an Animal ; and of that alone are Animals constituted : and therein do they differ from Plants, which indeed are animates, but destitute of sense.

Now in animals, motion doth always accompany sense, as a thing necessary to the conservation of the animal : for because it is preserved by nutriment, it stands in need of motion to procure that nutriment : but every animal by divine ordination, doth generate the whole and perfect simile to it self ; in which generation,

ration, matter is the seed of both sexes, masculine and feminine; or a certain simile, that is in stead of seed: although sometimes certain animates are produced out of putrefaction, yet there must be some certain seminal force therein, or else it could not be the efficient cause of any such generation.

(B) Because these' sublunaries do consist of dissimilar natures, therefore they are mortal & corruptible: therefore lest that God should seem to be wanting to them, he hath ordained that they that cannot remain in the same number, or at least in the same species, be revived by annual succession; and therefore by the benefit of procreation, that one species should proceed out of another; whence the life of the dead (as we may say) is placed in the memory of the living; and the

the father doth live in the son, as the artificer in his work. But as God is always the first cause of all natures, so is he the true, proper and first efficient cause in the rise of all animals: The secondary or instrumentary, are the animals themselves, whether masculine or feminine of the same species, that they may make one when they are united, and distinctly ordered to the obscene parts and instruments of generation: for the masculine is generated in another, and not in it self; the feminine doth generate in it self, and not in another: Where observe, that perfect animals onely can be said to proceed from the congress of the masculine and the feminine; yet some may be excepted: for of little animals, as insects, which are produced of putrid matter alone, without seed; so the fly **Cantharis**

tharis, hath neither masculine nor feminine: nor is it a Pnenix in-nature: soan Eel is of neither sex; and many other.

(C) It is disputed by some, whether humours or spirits may be rightly reckoned amongst animal parts; because they obtain no figure, nor certain mode of increment, like solid and dimense parts: but know, that we take the word *part* largely in this place, for all that which is necessary to the constitution of an animate body: for whatsoever may not be taken from the whole, without a dissolution of that whole, that may properly be called part of that whole: therefore humors and spirits, because if they be taken away, the animal whole cannot consist; therefore they are adjudged to pass under the name of parts,

But here it will be demanded,
whence

whence doth the dissimilitude of the four humours depend, from the efficient or from the matter? *Galen* and *Avicen* do assert, that blood doth arise from a moderate and temperate, choler from an intense, and flegme from a remiss heat. But *Fernelius* more rightly refers the cause of so great variety to the aliment; that is, to the material cause, because it is not consentaneous, the same heat, in the same time and part, to produce contrary effects: therefore the cause of this dissimilitude is referred to the matter. For whereas aliment (which is the matter) taken into our bodies, doth consist of divers parts, it is altogether consentaneous to truth, that those humours which arise from it, cannot be altogether of one and the same genus, but divers; for what part of the chyle is more temperate, is converted

verted by the liver into blood; and what more hotter, is changed into yellow choler; and what is crude, into flegme; and what is terrene, into melancholy. And these are familiar to the body, four manner of ways, as *Hippocrates* saith, by which we are constituted and nourished: for because the bodies of animals do disperse those things which are excrementitious, by certain occult foramens, and that by distillation; therefore they need aliment.

(D) Blood may be understood two manner of ways: First, for all the four humours, which are contained in the veins, which when opened, blood doth flow out, endowed with the four humours; for blood is not similar, but a mass conflated of different humours: Secondly, blood may be taken peculiarly and properly, for

for a pure sejoynd humor, which is known by this sign, that as soon as it is let out into a vessel, it concretes, and turns into clots, by reason of its fibres: this humour is called by *Hippocrates*, *hot and moist*, because it conserves the life of the animal, which consists of a humid, as though material, and a calid principle as formal; and it is also called *temperate* by *Galen*, because a hot and moist temperament, doth next accede to the temperature, because it is the fittest to produce animal-operations; and it is called *sweet*, because it arises from a moderate heat, and of a temperate and best part of chyle: it is called *Red* or *Rubicund*, because it acquires a colour from the liver, that is red: for every part propounds this as its end, to assimilate that to it self, which it altered; therefore chyle is taken from the ventricle, and
 trans-

transmuted by little and little to the liver ; and so by degrees, doth pass, and is converted into its nature : and hence it is , that it receives its colour ; from this doth every part attract aliment ; whence blood is called by some, the treasure of life, which nature so keeps in such safe custody, that all the other humors may receive loss , before blood : nay some have gone so far, as to go about to demonstrate , that the soul resides in blood ; others do affirm, that blood is essentially the very soul.

(E) Flegme , is gotten of the gross and watrish part of chyle : sometimes it is called sweet ; not that any dulcitude or sweetness doth possess it , as it is with honey or sugar : but so to be understood , as when we say sweet water, or water is sweet : and when we ascribe frigidity to it, we do
not

mean, that it is not partaker of the contrary, viz. heat; but because that coldness is predominant in it: for if flegme were onely cold exactly, then it would be coacted like unto ice; and if it were exactly humid, it were void of all *crassitude* and *lentor*: the effect of it is to nourish the flegmatick members, together with blood; and it is aliment half cocted, and in progress of time may easily make blood, and nourish the whole body.

(F) The matter of black choler or melancholy is the more gross and feculent part of aliment, not unlike to the fecies of wine, or the setlings of oyl. This humour is cold and dry, because terrene: neither yet so cold, but that it is a partaker of some heat, otherwise it would concrete like ice; nor void of all humidity, otherwise it would not be an humor,

mor, but a hard body like to an Adamant : its proper colour is black, or rather oleaceous, which in a temperate man, is called black : if compared with the colour of other humours, it is crass, by reason of its terrene nature; and it hath sometimes a sowre sapour, when much heat coacts the humidity; and sometimes sharp, when less heat, &c. its use is to nourish the gross, hard, and terrene members.

But here a question may be handled: whereas it is said, that melancholy is terrene, cold and dry, therefore unapt to all the motions, both of body and minde; its strange why *Aristotle* will have all melancholy persons to be ingenious, either in the study of Philosophy, or moral Policy, in Poetry, and many other Arts and Sciences. It is answer'd, that the strength of wit is discerned
and

and discovered, either by quickly learning, or strongly retaining. In this latter, melancholy persons do excel, because fixity is necessary and appropriated to the retentive faculty: therefore the brain is made firm and tempered from this humor, by the heat of blood and spirit; and indeed, those that are without this humour, are very forgetful: and though they may be ingenious, yet they are always found to be light and unstable, seldom persevering in the thing proposed, by reason of the levity of spirits; for judgement and prudence, is not perfected in motion, but in rest: whence *Aristotle* could affirm, that the soul is rendered more intelligible, by rest and quietness, then commotion and trouble.

(H) *Avicen*, besides those two before named, doth make other two adventitious humours, a-

mongst which those spoken of do possess a medium: the first is called *innominatus*, because it never flows out of the veins; but the second, the Barbarians call *Cambium*, because it desires to flow out, and would be changed into the substance of flesh: but both of them are rejected: yet *Fuchsius* would have this humor to be the same with the radical, but without reason.

Here it may be demanded, whether it may perpetuate life? because the oleous or radical is preserved and nourished with humidity, and new always substituted in the place of that which is absumed; for I do not see why, if radical humidity be wanting, that death should follow: but answer may be made, that the privation or defect of the radical humor, depends upon the impotency of heat: for whatsoever suffices

fices in the place of its native humour, that is necessary to be changed by the help of heat; which as *Scaliger* thinks, is altered and grows feeble, by use and diuturnity of time: therefore what accedes of aliment is more worse and impure, then that which decedes; therefore heat destitute of idoneous aliment, is dissipated. And hence it is that man necessarily must dye.

CHAP. 8.

Of Spirits.

I. **H**itherto of humors so called: Now we shall handle the doctrine of spirits: they are called (A) spirits, because they fly away by their subtil and aereal tenuity, which after a certain manner responds to the

Nature of Spirits indeed.

2. But here the word spirit is taken (B) for a very small or thin substance, aerial and vaporous; the first instrument of life, as to the performance of action.

3. Here its essence is not to be understood ethereal and celestial, but in a manner elementary: First, because such like spirits are what like their matter is; but their matter is elementary: Secondly, they can accend, refrigerate, increase, diminish, and extinguish: but the celestial, on the contrary, want these; neither can they be changed by natural cause: Thirdly, because to their preservation, the inspiration of the air is necessary: Fourthly and lastly, the spirits do restore again an elementary body, in a swounding fit.

4. A spirit is either insited, or fixed, or influent.

5. Infited, which is ordinarily (C) *complanatus*, is an aereal and tender substance, lying within several solid members, and procreated of the genital seed, from the governess faculty of the principal parts, the first and proximate seat of native heat, and a certain faculty, as it were, the band of union of the soul with the body.

6. Of this there seems to be so many differences; as there are natures and temperaments of parts, if it may be accommodated to these, and attemperated to the nature of every part.

7. The influent is that which is implanted; and lest it should dissolve and vanish, it remains fixed.

8. And here it is threefold; natural, vital, and animal.

9. And as in mans body, First, there are three Vertues,

Natural, Vital, and Animal : Secondly, so also there are three principal bowels, if I may so call them, the Liver, Heart, and Brain : Thirdly, three Organs also administering to these, the Veins, Arteries, and Nerves : so there are so many spirits, distinct in species and form, which are, as it were, the chariots of strength.

10. The natural is (D) a thin vapour, procreated in the liver, of the purer part of blood ; and thence diffused by the veins into the habit of the body, to absolve all natural actions.

11. Concerning this, many great questions are made : some do expunge it from the catalogue of spirits : First, because it takes its natural faculty from the Liver : Secondly, that it doth renew the same faculty insited from every part : Thirdly, and by this Spirit

rit or Captain, the gross blood is carried to distant parts.

12. The vital spirit (E) is a thin halite vapour, or breath, begotten of inspired air, and natural spirit; carried to the left side of the heart, and so runs by the artery over the whole body, and so supplies the vivifical strength unto them.

13. All the ancient Neotericks do conclude this to be coacted, when it is chiefly necessary to life: for as *Plato* doth affirm, if the sun should quiesce one moment, the whole world would perish, because it excites spirit and heat, by its motion: so here, if the spirits be prohibited, forthwith the Animal perishes.

14. The animal spirit is (F) a pure halite, begotten of a portion of vital spirit, carried to the brain and insited in its faculty, diffused by the nerves into the body, that

it may incite it to motion, sense, and all animal actions.

15. This, as it pleases some, doth not differ from the vital, in kinde and nature; because they maintain, that there is but one universal spirit: but as aliment doth take a new form, by a new coction, and thence a new denomination: So that first, there are divers Organs: Secondly, divers faculties: Thirdly, divers manner of generations; so also this spirit is diverse from the rest in species.

The Commentary.

(A) **B**Y spirit here we understand not an incorporeal substance, or the intellect of man, which is rightly called by the Philosophers, a spirit; which *Scaliger*, otherwise a man very learned doth seem to dissent from; for

for he speaks Theologically, and is to be understood, as speaking of an incorporate substance : but by spirit we mean a thin and subtil body.

(B) Because nature is not wont to copulate one contrary to another, unless it be with some medium, not unlike a band : for mortal and immortal, do differ more then in kinde ; and therefore an incorporate being, is not consentaneous to a brittle body, and immortality cannot be united to the intellect of man without the concurrence of a medium : and this is no other then a spirit, which doth bring mortality to the body ; having a thin and tender substance, as it were, acceding to the intellect. The medium between both, is nature : and this spirit is not void of a body, but begotten of the elements which were in the seed :
and

and it is most elaborate, nearly acceding to the nature of celestial spirits; and most thin; that it may fly all sence; very apt to pass, by an incredible celerity: for it passes over the whole body with a great celerity, that it may give motion, sence, and strength to its parts, and perform other functions of the soul.

(D) Concerning this spirit, many great questions are agitated: some do banish it from the catalogue of spirits, moved thereto by these Arguments: First, because there is no use nor necessity for it. We answer, Its use is great: for first of all, it is the chariot of aliment; for the humours gotten in the liver, can scarce penetrate of themselves, through the narrow passages, by reason of their crassitude; nor can they well be carried to the other parts of the body, by reason of the slowness
of

of their motion. Furthermore, this spirit takes its natural faculty from the liver; whose work is to attract, retain, and concoct familiar aliment to all the parts of the body; and by a certain force, doth expel the excrements. Secondly, they will have no place to be given by nature proper for this spirit. We answer, the liver is its fountain and principle; as the heart of life, and the brain of the soul. Thirdly, they alledge, that this spirit doth not lead any thing to any part, or carry any thing thereunto. But we say, that as the animal spirit is carried by the Nerves, the Vital by the Arteries: so the natural spirit is carried by the veins, together with the aliment blood, into the general mass of the body. But here another question will arise, how can the spirits flow into the inward and most remote

remote parts, but by penetration, and dimension. *Answer,* Some bodies are crass and solid, and some thin and tender: through those that are hard, they cannot penetrate; but the spirits, because they are thin, do fly all manner of sense, and are diffused without impediment in a moment, this way and that way, with a certain kind of celerity, and do pervade the members; neither by their presence filling them, nor by their absence emptying them.

(E) And in this spirit all the causes come to be considered: the matter is the natural spirit, procreated in the liver, thence carried by the *vena cava*, with the arterious blood (that is, the purest of blood) upwards, going into the right side of the heart, where it is attenuated most accurately, by the passages, not altogether

ther occult; but if a dog be dissected, it will be found in the left side: the efficient cause is the strong heat of the heart, attenuating and making thin the vital spirit: it's form its rarefaction, not unlike to the tenuity of a little flame: its end is to conserve life diffused from the heart, by the arteries, into the universal body.

(F) The matter of this spirit is that vital, which is carried by the crevices of the arteries, to the basis of the brain; and it doth slide thereinto as into a net; which is placed there by nature, as a labyrinth: for when any matter would exactly elaborate, it doth devise a longer stay in the instruments of coction, and afterwards by another context is intromitted into ventricles of the brain: the efficient cause is motion, but chiefly the proper force of the solid
lid

lid substance of the brain, whereby this spirit doth exactly elaborate, and so become animal: the form of it is rarefaction, made perfect by the degeneration of the vital spirit into the animal: its end is to shew a sensitive and moving faculty, with great celerity, from the middle ventricle of the brain, by the nerves, into the whole body; by which spirit the animal faculty is apprehended in man of reason and memory, if its force or motion be not hindered.

C H A P. 9.

Of the similar parts of an Animate body.

I. **H**AVING expounded the contained parts, the continent do follow, which consist of
sub-

substance, by reason of that firmness and solidity they have.

2. And they are either homogeneous or heterogeneous, similar or dissimilar.

3. A similar (A) part is that which may be divided into similes, according to the particles of sense, and into the same species.

4. Of similar parts, some are spermatical, others carnous.

5. The spermatick parts are those, which are generated immediately of the crassament of seed, and so coalesced into hard substances.

6. Of which sort are Bones, Cartilages, Ligaments, Membranes, Nerves, Arteries, Veins, Fibres, Fats, Skin.

7. Bones are the hardest parts (B) of animates, dry and cold, begotten of the crassament of seed by exustion, to the stability of the whole.

8. These

8. These are endowed with no sense: because first, no Nerves are disseminated by their substance; Secondly, if they were sensible, they could not endure daily labors without great pain; and that sensation would either take away the greatest part of action, or render it frustraneous.

9. A Cartilage (C) is a kind to these, which is a substance or part a little softer then bones, and harder then any other member; and flexible after a certain manner; made to the keeping of motion in its destinated parts.

10. A Ligament (D) is a simple part of the body, hard, and begotten of seed, yet softer then a Cartilage; and yielding to the touch, knitting the bones together.

11. A certain portion of these is called tendous, which is a similar part, begotten of Fibres, Nerves

(163)

Nerves, and Ligaments, mixed in a muscle; all which are called articles.

12. A Membrane is a similar part, begotten of seed, tender, covering several other parts.

13. The Nerves are spermatick parts, arising from the brain, or back-bone, the interior part of the marrow, the exterior of the membrane, carrying the animal spirit to sense and motion.

14. They are distinguished into softer or harder.

15. They are soft which do arise from the former part of the brain.

16. And they are seven conjugations: for none of all the Nerves are simple, but all conjugated; whence they are called *paria nervorum*.

17. The chieft of these are inserted in the centre of the eye,
and

8. These are endowed with no sense: because first, no Nerves are disseminated by their substance: Secondly, if they were sensible, they could not endure daily labors without great pain; and that sensation would either take away the greatest part of action, or render it frustraneous.

9. A Cartilage (C) is a kin to these, which is a substance or part a little softer then bones, and harder then any other member; and flexible after a certain manner; made to the keeping of motion in its destinated parts.

10. A Ligament (D) is a simple part of the body, hard, and begotten of seed, yet softer then a Cartilage; and yielding to the touch, knitting the bones together.

11. A certain portion of these is called tendous, which is a similar part, begotten of Fibres,
Nerves

Nerves, and Ligaments, mixed in a muscle; all which are called articles.

12. A Membrane is a similar part, begotten of seed, tender, covering several other parts.

13. The Nerves are spermatick parts, arising from the brain, or back-bone, the interior part of the marrow, the exterior of the membrane, carrying the animal spirit to sense and motion.

14. They are distinguished into softer or harder.

15. They are soft which do arise from the former part of the brain.

16. And they are seven conjugations: for none of all the Nerves are simple, but all conjugated; whence they are called *paria nervorum*.

17. The chiefest of these are inserted in the centre of the eye, and

and are called the visive or optick nerves, carrying the faculty of seeing unto them.

18. The second propagation of moving of the nerves, is the eyes.

19. The third society is partly scattered into the tunicle of the tongue, to propogate to the taste; and part dispersed in other parts of the face.

20. The fourth conjugation is a certain proportion dispersed in the palate.

21. The fifth is carried by the auditory passage, to the drum of the ears; and they are called the auditory nerves.

22. The sixth is a large portion of nerves, wandring and running almost through all the bowels.

23. The seventh arises from the hinder part of the head, and the marrow of the back-bone, and

and inserted into the muscles of the tongue, and is said to move the tongue.

24. The crasser nerves, in which there is a more obtuser faculty, and they do come out of the marrow of the back-bone, carrying sense and motion to the internal parts.

25. And thirty of these are alike, and combined, seven to the hinder part of the neck; twelve to the Thorax; five to the Lungs; six to the sacred bones: all which do disperse themselvs like boughs into the other parts of the body.

26. The Arteries (F) are hollow vessels, long, having two tunics, and those crass and substantial, ordained for the deducing of the vital spirit; and for temperating and expurging of the heart and other parts to heat.

27. And they do arise out of the heart; of which two principal

(166)

pal Arteries do spring out of the left side thereof: from which two, all the other take their original, *Arteria Aorta, et Arteria venosa.*

28. The great Artery Aorta is the foundation of all other Arteries, and doth carry the vital spirit to all the other parts of the body.

29. The venous artery is stretched out, like a quill, from the same side of the heart, into the liver, from whence it brings air to cool the heart.

30. A vein (G) is a similar part, and round and hollow, like to a reed, arising from the liver, consisting of one tunicle contexted of three Fibres, carrying blood for nutriment, together with the natural spirit, to the several parts of the body.

31. Veins are distinguished into principal, and less principal.

32. The Principal are those
out

out of which, as out of a trunk or stock, others do arise; and they are two; *vena porta*, and *vena cava*.

33 *Vena porta* is a great vein, coming out of the hollow part of the liver, and excepting all the Mesenterian veins; by which it takes chyle out of the ventricle and intestines, and so doth carry it to the concavity of the liver.

34. *Vena cava*, which is also called the great vein, doth arise from the bunchy part of the liver; and running over the whole longitude of the animal, carries the blood to all the parts for nutriment.

35. The less principal veins are branches of the former; and either they have peculiar names allotted, or not.

36. The branched veins are partly Mesenterial, and partly Hemorrhoidal.

37. The causes of these are
either

either external or internal.

38. The internal are the emulgent or seminal veins.

39. The exterior are the jugular veins in the head, the intercostal in the trunk, and the auxiliary in the arms : of these, and all the branches dispersed from them, into both the exterior and interior parts of the body, no particular names are allotted them.

40. The fibres are (H) similar parts, begotten white and solid, of seed, and dispersed everywhere over the whole membrane.

41. And they are either right, oblique, or transverse.

42. They are right, which are carried according to the longitude of the membrane, and do serve to attract aliment.

43. Those that are transverse, are such as are placed cross the
body

body, and they retain the attracted aliment.

44. Oblique are those that are obdused with an organ crooked, and do crosswise cut the two former, and have an expelling force.

45. Fat is a similar part (I) of the body, moist, without blood, concreted of the aerial and fatty part of blood, crupting by sweat, through the tunicles of the vessels, and congealed by the frigidity of the nervous parts.

46. The skin (K) is a similar part, ample and spermatick; and it is the covering of all the parts of the body.

47. To this may be added that which is no other then a thin and tender skin, not unlike to the peeling of an onyon.

48. Hitherto of similar parts, which are spermatick: they are carnous which are generated of
L blood,

blood, and they are the flesh of the muscles.

49. Flesh (L) is a tender part soft and rubicund, and concreted of coagulated blood.

The Commentary.

(49) **M**Any definitions of similar parts are delivered, both by ancient and late writers. *Aristotle* doth call that a similar part, which is divided into like parts; which definition almost all have kept; which notwithstanding seems to be imperfect; for it must be understood of those things that may be divided into similar parts, both according to sense and reason. As for example, flesh in the judgement of sense may be divided into parts, which are similar mutually to it self, and to the whole: but in reason or imagination, it

is divided both into the four humours of which it consists, and also into the four elements; which neither are similar mutually to it self, or by being compound to the whole: therefore this particle is rightly added in the definition, *according to sense*; whence also *Galen* makes mention of sense, saying, That these are similar parts, which are like in sense; and therefore those parts are called rightly similar, which do admit of no division altogether sensible, into diversities; and therefore they are called simple as to sense: For although the elements alone are truly simple, because they acknowledge no composition onely of matter and form; notwithstanding they are called simple and similar parts of animals; by a certain similitude and analogy: for those things which are truly similar

L 2

cannot

cannot be divided into the parts of a divers species, neither in sense nor reason; so that what things are onely similar in sense, are not to be divided into diversities, sense being judge.

(B) Bones are called by the Greeks *ὀστέα*, because their substance is hard and dry; whence it follows, that the same is chiefly terrene, that is, partaking more of earth, then of any other element: they are void of sense, because much portion of the nerves is disseminated by their substance, by the benefit whereof all the parts are sensitive.

But because some do assert that there is a notable sense in bones: We answer, that this sense doth not arise from the bones, but from that membrane, which doth cover the bone; for that being abraded, the bone may not onely be cut without any pain, but with-

(173)

without sense. But it may be objected, that the teeth are bones, which experience doth teach to be most exquisite in sense: I answer, That happens by accident, and not of it self; for certain soft and tender nerves do appear to be derived from the teeth; which because they are disseminated to the inward parts of the teeth, do so affect the substance thereof, that it causes great pain.

Furthermore, in hollow bones, marrow is contained, which is a simple substance, moist, fat, and white, and the aliment of those bones: this marrow is without blood, yet hath its original of blood, which doth distil out of the orifices of the vessels, to the Periostium, and so doth pierce into the cavities of the bones: the efficient cause is the frigidity of the bones; whence it is, that cold, and moist bodies do abound with

much more fatness and marrow, then the hot and dry : and for this reason, the bones of a Lyon do want marrow, which of all creatures is the dryest and hottest, because they have bones hard and dense. Its use is to nourish the bones, and to binde with its incalescency, with motions, and other causes.

(C) A Cartilage is called by the Greeks, Condros : its substance is terrene and solid, but not so much as the bone ; whence *Aristotle* doth rightly write, that the matter of a Cartilage and Bone, to be one and the same matter, onely differing in dryness : for a Cartilage is softer then a Bone, and somewhat flexible ; whence it gives place with its softness ; neither doth it resist, as the bone.

Its use is multifarious : for first, it is a certain stay and prop,
and

and makes the proximate parts more stable: Secondly, it admirably defends the bones from knocking or grinding together; but being annexed by the same, they may be more firm and stable: Thirdly, they promote and cause certain light parts to a promptness of motion, in the arteries: Fourthly, they defend them against many accidents; for their substance is idoneous to cover them, and defend them, because they being hard cannot easily be broken, or cut: hence we conclude with good reason, that a Cartilage is void of sense. (E)

(D) The most noted ligaments are in the trunk, or artubus: the ligaments of the trunk, are either in the head or thorax: in the head, either in the whole or in part: for a ligament doth convert the whole head with the spina, so the tongue with the jaws.

In the trunk of the joynts, there are ligaments knitting the bodies intrinsecally, and cloathing of them, as it were, extrinsecally: the ligaments of the joynts do connect other bones, *as ibi* with *os sacrum*.

But there is a certain portion of a ligament, called a tendon; consisting of the fibres of the nerves, and compelling them into one of the ligaments, serving the arteries to a voluntary motion: the fibres of the tendons growing of the junctures, are joyned amongst themselves.

(E) They are called spermatick parts, because they are generated of seed, and not of blood; which argues that their colour must be white and cold in substance: All nerves do arise from the brain, and not from the heart, as *Aristotle* imagined: their use is to carry that animal spirit got-

(177)

ten in the brain, and the motive and sensitive faculty, and to communicate it to the body.

(F) The veins and arteries are joyned with a friendly intercourse, that the veins may supply them with matter of spirit; for the spirit doth cherish the blood with its heat in the arteries; and there are mutual offices, that the spirit may take nutriment out of the veins; and the veins, spirit, and heat, out of the arteries. But the arteries and veins, do differ, First, in their original, because they come out of the sinister ventricle of the heart: Secondly, in their function, because they subminister vital spirits to the whole body: Thirdly, in their substance; for the arteries, so likewise the veins, do consist of a membranous body, yet more solid, harder, and confirmed by more crasser tunics.

Now a tunicle is twofold, exterior, interior : that fibre, which is knit with many strait and crooked windings, hath the like crassitude and firmness with the tunicle of the veins ; but this hath five times a more harder and grosser substance, lest the subtil spirit should exhale, and the artery it self be broken with the perpetual motion of the heart : Fourthly, in motion ; for the arteries are moved without intermission, by dilatation and contraction ; when dilated, they draw the cold air ; and when contracted, cast out hot fumes.

(G) This question is moved by Physitians and Philosophers, about the veins, Whether they have a force or faculty to generate blood ? Some maintain it, that the blood which the veins contain within themselves, to elaborate more exquisitely, and to be made

made by an infused force and faculty ; and therefore in that blood, that the chiefest degree of perfection is gotten. But the falsity of this opinion is easily known by those who diligently mark the thin tunicle of the veins , and its white substance. Now it is provided by nature, that every part of the body should be converted to the other, and transmuted into its colour : then how can the veins with their thinness and whiteness, change white chyle and gross, into red and pure blood ? Therefore more truer is that opinion, that the generation of blood is onely the work of the liver, which doth make blood, by a certain force and faculty, within it self seated : all the sanguifick force is given to the veins, yet they receive it from the liver, as *Avicen* demonstrates.

(H) *Aristotle and Hippocrates* do prove, that fibres do concrete the blood by their frigidity, because that blood out of which fibres are taken, can never be concreted by any cold: for when blood is let out of the veins, if it doth not concrete, it is a sign of death.

(I) Fat is the matter of blood: and although it be made of the cream of blood, yet notwithstanding it is cold, and without blood, degenerating into fat by the want of heat, and frigidity of the membrane: it consists of coldness and dryness, because by heat it is melted, and by the humidity of other parts coagulated by cold. The efficient cause is the want of heat; which is thus proved, because you shall finde no fat, as to any quantity, about the liver, or the heart, or any other hot part, by reason of the heat of those parts.

(K) Take

(K) Take this as another definition of the *cutis*: the skin is a thin part, membranous, porous, endowed with blood; the tegument or cover of all the parts of the body; which as it is easily taken away by accident, so it doth easily grow again; which denotes thus much, that the skin is not altogether endowed with a sensitive faculty, but onely so far as it hath the nerves, and of the faculty of blood in it: and whereas it is defined to be membranous, that is, smooth, simple, thin and white, and that it hath a middle nature between flesh and nerves; for neither is it altogether without blood, as the nerves are, so neither doth it abound with blood, as the flesh doth; whence it is adjudged to be the rule of temperaments: and indeed the skin about the hands, in it there is the most exquisite and

and perfect faculty of sense, but not so in other parts of the body : and the skin is porous, that it may thereby attract the coldness of the air, and expulse the excrementitious vapours of the body. Now the excrement which comes out of the pores, is sweat : sweat is an excrementitious humidity of the third coction, breaking out by the skin, in the species or form of water : the matter of sweat, is the whole humidity which is gotten in meat and drink ; which thing is necessary to all animals, because it might make way for other aliment, and not longer lie in the vessels : it is of the same genus with urine, onely differing in this, that the urine is carried to the bladder, this with blood, a longer passage through the body : its efficient cause is heat, but not so vehement as to have a drying faculty, but moist ;

so calefying the nature of sweat by the habit of the body, that it becomes thin, and so softens the skin by relaxation, that it may the better pass through: those whose skins are hard and thick, are very unapt to sweat.

(L) Flesh may be taken either properly or improperly: when properly taken, then absolutely that which is described by us, and it is the chiefeſt part of the muscles; for the substance of them doth truly and properly deserve the name of flesh; that which is taken improperly, is the flesh of the bowels, generated of blood poured out, as the liver, heart, and lungs.

C H A P. IO.

Of External dissimilar Parts.

1. **H**itherto we have spoken of similar parts. Now of dissimilar or organical, which are diversly compounded of the similar.

2. And they are either external or internal.

3. The external parts are, first, the head; secondly, the trunk of the body; thirdly, the artus, under which we comprehend the arms and feet.

4. The head is the highest part of the body, globular, set upon the neck, the seat of the animal faculty.

5. Its parts that are external, are chiefly the skull and the face.

6. The

6. The skull is a crass bone of the head, round, distinguished into twenty bones, and certain sutures, covering the brain, enviro-
ning it on every side.

7. Its bones are thus distinguished : there are two in the crown, one in the front, two in the temples, one in the form of a wedge, another in the form of a sieve, twelve in the superior jaw, and one in the hinder part of the head.

8. There are three sutures : The first is transverse the crown, going from towards one ear to the other, and doth knit the bone of the forehead to the rest of the body.

9. The second is called Sagittalis, which goes along the head, and doth knit the two bones of the crown.

10. The third doth ascend from the posterior part of one ear,

ear, to the end of the sagittal suture, and again deflects to the other ear, in the form of the letter A, and doth knit the bone of the hinder part of the head with the rest of the body.

11. Thus much for the skull. Now for the face, which is called that whole in a man, which is under the forehead; or, as *Aristotle* saith, That interior part which is under the skull.

12. This doth comprehend the eyes, ears, nose, cheekes, and mouth.

13. The eye is no other thing, then the organ of sight, consisting of tunicles and humors.

14. And because it ought to receive the several species of light and colours, therefore it is formed of pellucid matter.

15. The tunicles of the eyes (besides the white, which arising from the Peritoneum, doth joyn the

the eye to the head ; whence it is called *conjunctiva* and *adnata*) are four : First, the horny tunicle , which is clear, shining like to a horn : Secondly, the *Uvea*, which is like to the husk of a grape, and it adheres to the horny tunicle, embracing the apple of the eye : Thirdly, the *Retina*, or tunicle resembling a net , which is of the substance it self of the visive nerves , bringing an animal spirit to the eye , and again the Idea of the object to the brain : Fourthly, the *Aranea*, or like to sand, containing the chrystalline humor, and separating it from the white.

16. The humors of the eyes are three : First, the watry humour , which serves for the gathering of resemblances : Secondly, the glassy humour, for the forming of those idea's.

17. The ear is an organical part

(188)

part of the body, and the instrument of hearing.

18. Its nature is compounded of divers parts, very artificioſly; of nerves, membranes, bones, cartilage, which gathereth ſounds and ſo accordingly altereth them.

19. Its bones are firſt Malleus: Secondly, Incus: Thirdly, Stapes; of whoſe colifion ſound is ſaid to be made.

20. The noſe is an organical part, placed in the middle of the face; the instrument of reſpiration and ſmelling.

21. Its part is either ſuperior or inferior.

22. The ſuperior is the bony part, which is immoveable; and this the inferior part: the exterior is the back of the noſe.

23. The inferior part is moveable, which is the end, being round, divided into parts conſiſting of muſcles.

24. A

24. A cheek is nothing else then the superior part of the jaw, and the inferior.

25. The superior cheek is that part of the face next to the front, from both the ears to the lowest part of the jaws.

26. The inferior is the moveable part of the face, containing the teeth.

27. The whole mouth is called that space which is between the lips and the jaws; in which is contained the teeth, the tongue, the palate, and throat-pipe.

28. The teeth are (A) the hardest of all bones, hollow within, endowed with veins, arteries, and nerves, ordained for to soften and prepare meat for the stomach.

29. Those are in number thirty; twenty whereof are accounted cheek-teeth, eight cutting, which are the foremost; and four eye

(190)

eye-teeth, in either jaw two.

30. The tongue is (B) a carneous part, rare, and lax, the organ of taste and speech.

31. The palate is the superior part of the mouth, a little concaved, bored through with many holes, by which flegme doth ascend from the brain into the mouth.

32. The throat-pipe (C) is fungous flesh, long, hanging from the palate to the mouth, conducting to the moduling of voice in a man.

33. Truncus is the whole body, with head, arms, or legs.

34. Some part of it is anterior, and some posterior.

35. The anterior again is either superior, and that is called the thorax; or inferior, that is, the belly.

36. The thorax (D) or brest, is the anterior part of the trunk, which

which is subject to the neck; and it is the seat of the vital members.

37. Its proper parts are either soft and fleshy, or bony and cartilaginous.

38. The carnos parts are those many muscles placed in the thorax, of which sort are all the muscles of aspiration, and scapulation; some of them moving the arms.

39. To these carnos parts, belong the paps, which are parts sited or placed on each side, in the middle region of the brest; glandulous, and woven with veins and arteries; serving for the generation of milk in women.

40. For these parts, for their rare and cavernous substance, which they have, do receive into them menstruous blood, which is the matter of milk, which afterwards is levigated, cocted, and

and converted into a white liquor; both by a specifical vertue of the flesh of the paps, as also from the heat of the heart, whereunto it is near.

41. Hence *Aristotle* rightly concluded, that milk was nothing else then superfluous blood, changed and made white.

42. The bony parts thereof are threefold; the first bone is called *Sternon*, and *Sethos*; and it is on the anterior part, in which the ribs do meet, and under which the mouth of the ventricle doth lie hid.

43. The cartilaginous extremity of this, is after the form of a spear, or buckler, and it is called *malum granatum*.

44. Secondly, the two neck-bones, which are called *cleides*, and these bones are twins, subject to the neck, declining to the tops of the shoulders.

45. The

45. The thorax (E) consists of twenty four ribs, twelve on either side; and they are either true, or counterfeit.

46. They are true which are coarticulated, and they are the seven superior.

47. The spurious or imperfect, are those that are not coarticulated; and they are the five inferior.

48. The inferior part of the thorax is portended from the breast, where the true ribs end, backwards to the hips or pubes.

49. The exterior part of this, above the belly, is portended to the going down of the spurious ribs, and is called Spigastrion: the inferior proceeds from the belly, even to the hairy parts of the genitals, and it is called Hypogastrion.

50. The posterior part of the trunk is called the back, and it is

all that part which descends from the neck to the buttocks.

51. Its substance is constituted 1. of the shoulderblade, 2. *Spina dorsi*, 3. hip-bones.

52. The shoulderblades, are two bones, placed after the thorax in the back, articulated in the arms, to strengthen the ribs, and for the implantation of the muscles.

53. *Spina dorsi* is no other thing, then that series or structure of joynts, extended even from the first joynts of the hinder part of the neck, to the lowest, called *Coccygus*.

34. There are in number of these joynts thirty four; seven whereof are of the neck, twelve of the thorax, five of the loyns, six of the sacred bone, four of the *os Coccygos*: twenty four of the foremost are rightly named joynts, because by them the bo-

(195)

dy is turned divers ways; the rest are called rather by similitude, then reality.

55. The hip-bones are two strong bones, placed within the os sacrum, and ending in the buttocks.

56. But os sacrum (H) is constituted of many bones, to wit, five or six, sited almost in the middle of the body: other bones, both superior and inferior, resting upon them, are moved thereby.

57. The Artus are two, the hands and feet.

58. The whole hand (I) is that which is portended from the shoulderblade to the end of the fingers.

59. It is divided by Hippocrates, into three parts; into the arm, the wrist, and the hand it self.

60. That is named the arm, which extends from the shoulder

to the elbow, and doth consist of one great bone, and many muscles; seven whereof do govern the motion of the arm, and four govern the motion of the wrists: and it doth consist also of three chief veins; the humerary, axillary, and median.

61. The wrist is that part from the elbow to the hand, and consists of two bones, the greater and lesser whereof are both called Ulna; which consists also of thirty three muscles, prepared for the motion of the arms and hands.

62. The hand reaches from the wrist to the end of the fingers; the organ of apprehension.

63. The parts of this again, are brachial, postbrachial, and the fingers.

64. The brachial, or wrist, is part of the hand; it consists of eight bones, the ligament being transverse.

65. Post-

65. Postbrachial is that part of the hand, placed between the wrist and the fingers; whose posterior is articulated with the wrist, the anterior with the fingers.

66. The fingers are in number five, every one consisting of three little bones: the first is that which is the greatest in strength and magnitude, and is called Pollex; the second is called the Index and Demonstrator; the third the middle; fourthly, the Ring-finger; fifthly, the least.

67. The foot (K) is part of the body, which is inserted into the hip, the organ of walking and standing.

68. Its parts are three; the thigh, the shank, and the foot.

69. The thigh doth reach from the hip, even to the knee, consisting of a bone the greatest of all, with muscles, and glandulous flesh.

70. The knee is a knitting or dearticulation of the thigh and leg, whose anterior part is called Patella, and Posterior, Poples.

71. The shank is a part, reaching from the knee to the foot; the anterior part is called Anticnemion, and the posterior Gastrocnemion.

72. The shank doth consist of two long bones: the interior and greater, is called Tibia; the exterior, or less, Fibula.

73. The foot doth begin at the end thereof, and reach to the extremity of the toe; and doth consist of thirty eight bones, and two muscles, whereby the toes are moved, bended and extended.

The Commentary.

(A) **T**eeeth are said to have sense, by the communication of those soft little nerves pro-

proceeding from the third rank of nerves ; because those teeth that are formost, or extant without the jaws , are not capable of sense ; but those that are covered as it were, with flesh in the jaws, are very sensitive ; because the nerves and their virtues are extended to their region. But now that part of the tooth, which appears naked is insensible: This I prove : if it be cut, filed, broken, or burned with a hot iron, it is not sensible of any of these : Therefore in this very thing do teeth differ from other bones, because the teeth are perpetually nourished and increased ; which cannot be, except there were instruments to convey this unto them. But other bones onely take their determined increment.

(B) The substance of the tongue is laxe, and therefore fit to be moved in every part : and be-

cause it ought to judge of savors, therefore it ought to be rare, that it may be easily imbued with the humour of saviours; and that it may perfectly feel and distinguish of all kind of saviours, it hath certain nerves implanted in it from the fourth rank.

(C) This Particle alone is proper to man: for it avails much to the tuning of the voice; and therefore it is called by some Plectron.

(D) By ancient writers, that part of the body which reaches from the neck to the Genitals, is called the Thorax; so that according thereunto, the belly is contained under the name of Thorax. But Later Medicks, with *Galen*, do account that part onely the Thorax, which is included between the sides or the region of the paps: It is called Thorax, *apo to thoro*, for the continued

tinued motion of the heart: its use is to be dilated and compressed, to the motion of the vital members, which contains in it self the benefit of respiration: the substance of the **Thorax** doth consist of muscles, paps, and gristles, or bones.

(E) They are called **Cleides**, because they shut up the coarticulated humour, with the shoulderblade, lest it should slip into the brest, thorax, or arm.

(F) The ribs are numbred to be twenty four, each side containing twelve; where observe, that this number is not always found: for in some are found thirteen, and in some but eleven; which happens by reason of the matter either abounding or deficient. Therefore *Aristotle* doth erre, in asserting that there are but onely eight bones in the side of a man, and in some nations onely seven.

And as many ribs as there are in a man, so many there are in a woman : and therefore altogether ridiculous is that Comment, that there is one less in a man, then in a woman ; or one abounding more in a woman, then in a man.

(G) The belly is a part of the body, which reacheth from the breast, where the ribs end, even to the privities : and it is divided into three regions ; the first above, about, and below the navel : above the navel, from the midriff to the navel, Epigastrium, and Hypochondrium ; the middle which is, as it were the center of the navel, which is formed of two veins, and so many arteries, which carries blood and spirit for the nutriment of the yong, and conveys back again the excrements : about this are the ~~visc~~visc, both viscine parts to the navel ; so called, be-

because they are empty : below the belly is contained the Hypogastrium, which is that part of the belly, which reaches from the navel, even to the genitals.

(H) This bone is called Sacred, because it is great, broad, and ample : Hieron with the ancient is great : this doth consist of many bones, coagmented together ; which notwithstanding in tender age may be separated ; yet in old age, with much coction, so much coalesced, that it is almost incredible to believe, it consists of many bones.

(I) *Galen* and *Hippocrates* do call that the hand which is from the shoulder to the fingers ; that which *Aristotle* calls *brachium*, we call *manus* ; and the Germans, *Ein hand*.

(K) It consists of a superficies and substance : the superficies is distinguished into five regions, which

which are these ; *Calcaneus* ,
 and that is the posterior part, the
 mount of the foot ; by the Greeks
 called *Tharſos* ; and by the Ara-
 bians , *Raſcheta* : and it is the
 first part of the foot , along to the
 toes , *Plantis* , or *Planta pedis* ,
 which is called the interior part
 of the foot. *Vola* , which is the
 concavity between the two
 mounts of the sole ; the toes cal-
 led *Digitis* , in number equal to the
 fingers of the hand ; its substance
 doth consist of thirty eight bones,
 and two vicine muscles , by
 which they are extended , bend-
 ed, moved, and adduced.

CHAP.

C H A P. II.

Of the inward Organical parts of the belly.

1. **H**itherto we have illustrated the External dissimilar parts. The internal compounded members do follow, which are not exposed to the eye, but contained inwardly in the belly, being covered by externals.

2. And they are contained in the belly, either in the bottom, middle, or top thereof.

3. Those members (A) that are contained in the lower region of the belly, are called natural organs, because they serve the natural faculty, or vegetive soul.

4. And they serve either for nutrition, or generation.

5. Those

5. Those that are ordained to serve for nutrition, are either of the first concoction or second.

6. Those that serve for the first concoction, are the mouth of the stomach, the stomach and intestines.

7. Oesophagus or mouth of the stomach is a part membranous and nervous, consisting of two tunicles, coming from the jaws to the superior mouth of the ventricle, carrying meat and drink into the stomach.

8. The stomach (B) succeeding the Oesophagus, is a membranous, hollow, and spherical part, consisting of two proper tunicles; placed under the Diaphragma, almost in the middle of the body; and it is the shop of the first coction, converting the ingested nutriment into chyle; whence it is properly called *cul-de-sac*.

9. It

9. It hath two orifices, whereof the one is frequently called the stomach; and by ancient Medicks *Cardian*, because it is endowed with a most exquisite sense: the other which is inferior called *Pylorus*, is, as it were, the port or entrance.

10. The *ventricle* is enrolled in a little skin, which is called *omentum*; and it is a *membrane* consisted of two tunics, arising from the *peritoneum*, interwoven with many nerves, veins, and arteries, covering the ventricle, and cherishing its heat.

11. There are certain continued intestines to the ventricle, which are long, round, and hollow bodies, reaching even to the fundament; appointed, constituted, and ordained, for the altering of meats, distributing of chyle into the liver, and for the carrying away superfluities.

12. And

12. And although the intestines are one continued body, yet by reason of their substance and situation, are distinguished into *gracila* and *crassa*.

13. Those intestines that are called *Gracila*, are those whose substance is thin and rare; and the superior are these three, *duodenum*, *jejunum*, and *ileos*.

14. And these are ordained for the receiving and distributing of chyle.

15. *Duodenum* (D) is a slender intestine, or gut, adhering next to the ventricle, twelve fingers in length.

16. To this doth belong a certain passage, coming from the vessel of the gall, which conveys yellow choler; and by its acrimony the intestines are stimulated to excretion, and disturbed by thin flegme adhering to the membranes.

17. Je-

17. Jejunium is (E) a hungry gut, having many mesaraical veins, which snatch the best part of chyle out of the whole concoction; so that the rest of the intestines seem empty.

18. Ileos (F) is a gut more slender then the rest, having many anfracts; and therefore doth retain chyle longer, that it may eliciate its juice better.

19. Those intestines, that are called Craffa, are those which have a thick tunicle; and they are three inferior, Cæcum, Colon, Rectum; and these are the receptacle of excrements.

20. The matter of these excrements, is the terrestrial and dryer part of chyle, accommodated to no use of the body, daily swallowed up into the intestines with part of choler.

21. Cæcum is (G) a gross intestine, broad and short, having one
orifice,

(210)

orifice, into which comes the *Ileos* and *Colon*, receiving excrement, and eliciting the other juice, and so transmitting the rest of the *fecies* into *Colon*.

22. *Colon* (H) is an intestine grosser then the rest, having many great anfracts, like unto cells, receiving the *fecies*: and lest they should flow with an involuntary flux, it makes the passages more narrower.

23. *Rectum* is (I) a gross intestine, lower then the rest, crooked with many windings and turnings; it reaches to the very fundament, and carries out the excrements.

24. The inferior part of this intestine, is constringed with many muscles into a globular form.

25. In the middle of the intestines, is placed a certain pannicle, and it is called the *mesentery*, which

which is a membrane consisting of two tunics, and an innumerable veins and arteries, full of fat, connecting it self, and gathering, as it were, into folds.

26. Thus much of the members of the first concoction: the second serve either to elaborate profitable aliment, or to convey away inprofitable excrement.

27. The liver is occupied in the making of good nutriment.

28. The liver is (K) an organical part of the lower belly, consisting of red flesh like to blood newly coagulated; it is placed near to the Diaphragma, and in the right side of the Hypochondria; and it is the shop of blood; its action is cal'd, *κρῖσις αἵματος*.

29. It hath two parts (L) or superficies, the exterior and interior: the exterior is called *Gibba*; and it is light; the interior is named *Cava*, and it is rough.

30. Members (M) which are of the second concoction, serve to carry away excrements; and they either evacuate choler, or serose humours.

31. Choler is either black or yellow; the gall receiving the former, the spleen the latter.

32. The little vessel of the gall is a membrane, having one simple tunicle, but woven strong after the manner of a hair bag, long and round, connexed to the hollow part of the liver; drawing choler from it, and driving it into the intestines.

33. It hath two conduits, as it were, or channels; the one is carried into the liver, alliciating choler into it; the other into the Duodenum, detruding the same into the intestine.

34. But it is not carried into the bladder of the gall, by the proper and alone motion of an element.

elementary form; but partly derived from the liver, because it is an excrement, and partly drawn from the vessel.

35. But it doth not attract for nutritions sake: First, if choler be an excrement, then it is an enemy to the body, not in quality alone, but in quantity also, because the humour is bitter and mordacious: Secondly, neither doth it concrete like blood, therefore it cannot be assimilated to the body, but doth draw it for occult conveniences.

36. The spleen (N) is a thin member, spongy, consisting of obscure flesh, placed in the right-side of the Hypochondria, adverse to the liver, attracting from it black choler.

37. The spleen doth allure to it self this juice, by a strange providence and occult familiarity, embrued not with pure and unmix-

mixed, but with better and more nourishing blood, whereby it is cherished with profitable juice.

38. But a portion of this noxious humour, is gathered into the bottom of the ventricle, to excite appetite; the rest slides into the intestines, and so is thrust out of doors.

39. The reins and bladder purge out a wheyish or serose humidity.

40. The reins (O) which are in number two, are carnos parts, thick and solid, purging out blood with a serose humor.

41. Both the emulgent veins and ureteres, serve to evacuate serose humidity.

42. The emulgent veins do arise from the *vena cava*, and are inserted into the reins, dispersing abroad an aguous humidity with blood, and carried to the reins.

43. The ureteres are two urinary

nary channels, arising from the cavity of the reins, white, consisting of one simple tunicle, deducing the urine by the force of the reins, into the bladder.

44. The bladder (P) is a nervous part, consisting of two tunicles, interwoven with a treble kinde of fibres, round, and somewhat long, placed in the Hypogastria, taking the urine brought from the ureters, and conveys it out of the body.

45. There are two parts of it, the bottom and the neck.

46. In the bottom is contained the urine; and this passes by degrees thorow the neck: a muscle there, as a porter, obstructing its fluor, lest it come at unawares upon us.

47. And thus much of the members of the nutritive faculty. Lastly, there are organs of generation, which are accommodated

ted to continue and propogate their kinde.

48. And these are either common to both sexes, or peculiar to one.

49. The common are the seminary vessels, cods and stones.

50. The seminary vessels do ascend from the stones, upwards, inserted in the cods. (*Parastaten adunoeide*) and the seed is the profitable superfluity of the mass of blood, which is the matter of the seed and vital spirit, producing heat into the act of the seed, and carries it to the stones.

51. And they are two, the right and left; the former arises immediately from the trunk of the *cava*, the latter from a branch of the emulgent veins.

52. The testicles (Q) are soft parts, glandulous and white, rare, and cavernous, in which the seed is perfected and cocted.

53. In men they hang without the body, but in women they grow on the back; one on each side.

54. ~~Flapentia~~ (R) are two vessels, candid, cavernous, and glandulous; arising from the testicles, carrying seed into the testicles. In men they are placed at the root of the yard; in women, at the bottom of the matrix.

55. To conclude, there are members peculiar to one sex; either to man or woman.

56. Competent to man (S) is the yard, which hangs on the forepart of a man, of a good length, fistulous on every side; a fit instrument for the conveyance of seed.

57. And it doth consist of two hollow nerves; one passage common both to the seed and urine; four muscles, and as many veins and nerves: and lastly, of

a nervous membrane, and skin.

58. The end of it is called *glans*, consisting of a fleshy substance; which is covered by a loose skin growing over it, which is called *Preputium*.

58. Proper onely to a woman is the matrix, or womb; and it is the membranous part of a woman, consisting of a tunicle coagmented, as it were, of two things divided, round, and placed in the bottom of the belly; forming the yong of prolifick seed; and by a proper faculty, cherishing the same; and when it comes to maturity, it excludes it.

The Commentary.

(A) **T**He aforesaid natural members are involved in three pannicles; the *Peritoneum*, *Omentum*, and *Mesenterium*. The *Peritoneum* is a thin membrane,

brane, broad, and continued, like to a Weavers Loom, or Spiders Web; involving and containing all the bowels of the inferior belly; binding them to the back, lest they should fall down: it helps also the putting forth of the excrements; which when it is too little, it is broken. The Omentum is a double membrane, arising from the Peritoneum, interwoven with many nerves and arteries, and covers the ventricle and intestines: Its use is, that it may cherish the ventricle, in whose bottom it lies, and holds the heat of the intestines which is shut up, and so to increase with its own heat: it is called with the Greeks, Epiploon; because of its fatness with which it overspreads the belly. This tunicle is the first that appears after the incision of the belly. The Mesenterium is a double mem-

ber, consisting of two firm tunicles of the Peritoneum, and of many veins, arteries, and nerves, placed in the middle of the intestines, as its centre : its use is to contain the intestines, that they may not lose their proper foldings; and that it may contain them more strongly, it consists of a hard and double tunicle, which arises from the Peritoneum : the veins which are in the Mesentery, do arise from *vena porta*, and from thence do run between two of their membranes to the intestines, that they may thence take chyle : and they are called *mesaraicæ venæ*.

(B) There is onely in man one ventricle, but in other animals more; sometimes two, sometimes three; as in sheep, goats, oxen, and harts; that those hard meats, wherewith they are fed, may pass through divers ventricles :

cles, for their better preparati-
on and coction. The ventricle is
called by the Greeks *Gaster* and
Colia; its substance ought to be
membranous, that it may be ex-
tended and again corrugated, ac-
cording to the plenty or scarcity
of nutriment: its figure is spheri-
cal, or round, like the form of a
long gourd, for the capacity
of aliments; for if it were square,
a portion of the food would re-
main in the angles; which if it
should happen, man would con-
tinually be in a fever: it is long
also, by reason of its situation;
and hath two orifices; the one
whereof is at the top, for the re-
ceiving of aliment; the other at
the bottom, to convey it to other
parts of the body, when it is
made and converted into chyle:
it hath two tunics constituted
of its proper substance, one
whereof is internal, the other ex-

ternal : the internal is wholly nervous, gross, and woven with straight fibres, running down the back, that it may better contain humid bodies, lest they pass, as it were, through a strainer; and also that it may be extended to all positions : the External is wholly carnous and soft, consisting of many fibres, and those transverse; that after the meat is cocted, it may the better be driven out : it hath also a third tunicle arising from the Peritoneum, and doth involve the ventricle to the *duodenum intestinum*, of which the temperament of the ventricle doth appear, which is cold and dry, and therefore convenient to the nature of nerves : it hath also a native heat, without which it cannot make a perfect concoction; which is increased from the liver and spleen, and other vicine members : its seat is
 thus,

thus ; the superior part of it doth touch the Diaphragma in the left side , and so falls into the the right side of the liver , where it rests ; its bottom reaches from the left side into the right , and shews the place of the spleen : its utility is famous , for it serves the nutritive faculty , and that divers manner of ways : in its orifice the animal appetite doth reside ; for when all the parts of the body desire the aliment , which succeeds into the place of a vacuated substance , they endeavor to draw it from the veins , the veins from the liver , the liver from the *vena porta* , the *vena porta* from the intestines , and the intestines derive it from the stomach , in which forthwith there is a desire of more aliment , which is called hunger , or thirst ; it alters the aliment ; it receiving concocts it , and changes it into

N 4 chyle,

chyle, and that in the space of five or six hours.

(C) The intestines are called by the Greeks *Entera*, whence doth arise that word, to *Exenterate*, that is, to embowel: their substance is not much different from the ventricle, yet a little thinner; they have double tunicles, partly that by a greater force they may drive out the excrements, and partly from a certain providence of nature, that if the interior be putrefied and calcinated, the exterior may be safe, that the chyle may not flow out: and the interior tunicle is more carnous, the exterior membranous: it is endowed with crooked fibres, the better to be enabled to propel matter. The intestines are folded with many windings and turnings, that the chyle may tarry longer in them, and the aliment may
not

not so soon slide out: for those animals whose entrals have but few windings are voracious; concerning which, *Pliny* writes very gallantly.

(D) *Intestina Gracila*, the first is the *duodenum*; it hath no windings, but is strait, and that because it hath many cells, which do easily retain the fecies, and may thereby, at will, hinder the distribution of chyle: the passage also of this doth touch the vessel of the gall, which carries yellow choler; and so by its acrimony, helps the propulsion of the chyle, and that it may cast out the stegmy excrements of the intestines.

(E) It is called by the Greeks, *Nefis*, because it doth quickly transmit the chyle, both for the greater number of *Mesaraical* veins, which are engrafted into this intestine; and also because the more sincerer part of cho-

ter doth flow into it.

(F) This last intestine, because it is more tender then the rest, is called Lepton, because in it there is much chyle; and that for this use, that it may draw a certain moderate quantity of meat into them, lest that it flow forthwith gross into the intestines: in this there is sometime an obstruction that happens; and it is called *Iliacus morbus*.

(G) In some brutes, to wit, Dogs and Hogs, and other crude animals, this intestine is like to a thick broad bag: but in man it is a certain small appendix of the Ileos, convolved in the manner of a worm, scarce exceeding the latitude of two fingers, and longitude of one; it is called by the Greeks Tuphlon, because it hath but one hole.

(H) It is called Colon, as though *κολων*, that is, a sheath

or a case; or καλοβον, that is, mutilate, or cut short, because it hath divers turnings cut as it were into cells; which cells indeed do contain dry excrements, called *Scubala*, that is, the dung of Dogs, some call it καλον απο τῆ κοιλίας that is, from its tormenting pain, and passion, which this intestine is often affected with, when its passage is stopped with cold and gross humours, or filled and dilated with winde.

(1) The strait intestine is called *Apeuthymenon Enteron*, because it is not folded, and thereupon it makes a more easie excretion of excrements; it is called *Principal*, for its use which it hath: for if man did not enjoy that excretion it makes, how would he live? it hath a muscle adjoyned, which goes about its seat, and constringes it; and therefore it is called *σφιγκτηριον* it hath also

also the Hemorrhoid - veins,
which expurge feculent blood or
melancholy.

(K) The liver is a most gene-
rous member, and reckoned a-
mongst the principal organs of
the nutritive faculty; it arises
from effused blood, gross, and con-
creted; almost on the sixth day
from the seed conceived: and be-
cause it is like to the substance of
blood, it retains its qualities or
temperament of blood; for it is
hot and moist: and as it is gotten
of blood, so it hath power to get
blood; for it doth convert into
blood, or an assimilated redness,
like to it, the chyle which it re-
ceives within it self, by a natu-
ral propension, or specifical ver-
tue; for it alters every thing in-
to that colour, wherein it is to be
altered. But some will say, that
there are other humours gotten
also; therefore it is not the shop

of blood alone. I answer, that happens by accident, but it is the instrument of blood alone by itself: again, blood is to be taken two manner of ways; either for pure blood, or blood that doth contain in it the other three humors; yet blood predominant over all: and in both the latter especially the liver is the shop of blood. But some again will say, a natural agent doth not produce divers affects, because nature acts by one and the same manner: but the liver is the natural agent; therefore it doth not produce divers effects. I answer, That to happen for the diversity of matter, in which the liver acts and rests; for of a terrene portion it produces melancholy; of crude and cold parts, flegme; of subtil and fervent, choler; but of a mean or middle part, it produces true blood: for although the
liver

liver doth excite these functions by it self, yet it takes and uses as instruments, spirits, both natural and vital, which have their passage by small arteries. Its figure is a semicircle or half moon: it is placed in the right side of the Abdomen, under the spurious ribs.

(L) The Gibba is the bunchy part of the liver, and Sima the cavity thereof. The Diaphragma succours the Gibba, and the proper flesh of the liver doth reside in it; and it is called Culosis, which is a conversion of chyle, separated from its excrements, into an idoneous mass for nutrition, that is, blood: in this do the veins gather into one, which is called *cava*, which do carry the blood into all the parts of the body. Sima is the hollow part of the liver, which doth cover the ventricle in the right Hypochondria,

dria; and in it is made Haimato-
 sis ; which is an alteration of
 chyle, into a fluent and succu-
 lent liquor : but in the middle
 part of the liver, where the bran-
 ches of *vena porta* do meet, is
 made Diacrisis, that is, a separa-
 tion of profitable humours from
 the excrements.

(*M*) As in an artificial Kit-
 chin, there are not onely vessels
 for the preparation and coction
 of meat, but also others for more
 baser uses : so in the Kitchen of
 our bodies, that is, the middle of
 the belly, there are some organs
 which are constituted for the
 concoction of meat, and some for
 the receiving and conveying a-
 way of excrements ; and like as
 there are three concoctions in
 our bodies, so there are three ex-
 crements, and three kinds of ves-
 sels instituted for these. In the
 second species of concoction these
 ex-

excrements are generated; one somewhat heavy, answering to fecies, to wit, melancholy juice; another somewhat light, and more of air, like to flour, to wit, yellow choler; the third watry and serous: now every one of these hath distinct receptacles; and because choler is expurged first of all, therefore its receptacle is nigh to the liver. And concerning these vessels, we have before treated: the use of this vessel, the gall gathered therein doth shew; and the cause is expounded, why there is no branch carried into the ventricle from this vessel: the figure of this vessel is long and round, after the form of a Pear; its substance is membranous, that it may accordingly be filled or emptied, contracted or dilated: it hath one thick and proper tunicle, yet notwithstanding contexted of a tre-

treble kind of fibres : within it the fibres are strait, whereby it allures choler into it ; and they are somewhat crooked, by which it retains it ; but without they are transverse, by which it protrudes it.

The use of this vessel of the gall, is to receive choler ; and if it be carried over the whole body, it offends, because it is endowed with a fiery vertue ; for it hinders nutrition, and inflames the body much. Why gall is gathered into this vessel, is upon a double necessity : First, that it may heat the liver, and hinder putrefaction, it calefies the liver, because its humour is more hot and sharp, then blood : it hinders putrefaction, because it takes away the abundant humidity of the sharp humour : Secondly, that it may drive out of the ventricle the chyle into the
intc-

intestines, together with its superfluities.

(N) The spleen is a terrestrial member, because it attracts by a certain symbole, to it self, the terrestrial part of blood: in man its flesh is obscure, but in hogs, it hath a white colour; but in dogs a more splendid redness then the liver: It is lax and spongeous, that it may the better receive the feculent and gross humour into it self; and that it may not quickly delabe out of it, but continue longer in it, that it may be made more apt for its nature, and so be nourished by its better part.

(O) The substance of the reins are hard and dense, like to the substance of the heart; the humour thereof is thin, and therefore with more difficulty attracted: When the humour here is very watrish, it cannot be expurged

purged with a convenient celerity from one rein; and therefore there are two, which are placed near the spina dorsi, at the beginning of the loyns: the right part thereof in a man, is under the liver; the left, under the spleen: the emulgent veins and ureteres, serve to evacuate the ferous humidity to the reins.

(P) The substance of the bladder, is nervous and membranous, that it may more commodiously be extended & corrugated, when it is full or empty; and it ought to be extended, lest the water flow out at unseasonable times, but contain a moderate quantity thereof: it hath two tunics, the one proper and internal, whose substance is dense and firm, lest it should be eroded by the humour of the air; and this is interwoven with fibres, within strait, and without transverse

verse, which are for the attraction, retention, and expulsion of urine : the other is an exterior tunicle, improperly so called, and hath its rise from the Peritoneum : it hath a fleshy neck, having a muscle, whereby it is constringed, that it may hinder an involuntary flux of the urine.

(Q) The stones in both sexes, are made for the ingendering of seed ; therefore the substance of them are glandulous, white, and soft, that such a seed may be produced, by reason of the required similitude between the generating, and that which is generated : but it is made crass, and in colour white, by reason of the exquisite coction made by the interior heat of the vessels and stones : as the menstruum of the dugs is converted into milk, and dealbated ; so the stones do make blood prepared in the sperma-
tick

tick vessels by coction perfect seed, which becomes idoneous for generation.

(R) They are called Parastatae, for their similitude: for Parastata signifies certain folds gathered within themselves.

(S) The substance of the yard of a man, is spongiuous and rare, that it may be both erected and flank, stiff and soft; but in other animals it is bony; as in a wolf, dog, or sea-fox: but if it were bony in a man, it would be an impediment in the main business.

CHAP.

C H A P. 12.

Of the parts of the middle belly serving the vital faculty.

1. **H**AVING expounded the natural members of the lowest region, we proceed to the parts of the middle cavity, which are called vitals; and they are placed in the thorax, and they are the heart and the lungs.

2. But these organs are distinguished from naturals, by a certain partition-wall, which they call Diaphragma.

3. And the (A) Diaphragma is a round pannicle, consisting of flesh, nerves and membranes, going cross to the sides, and tyed to the back, the twelfth joynt, dividing the natural members from the vitals.

4. A certain thin membrane called Pleura, doth succinge and embrace all the parts contained in the thorax.

5. Now the heart is (B) a principal part of the middle belly, consisting of hard, dense, and solid flesh, woven with a treble kind of strings, of a Pyramidal form, not unlike to a Pine-nut; and it is the house of the vital faculty.

6. For it is the principle of (C) life, the fountain of heat, and nectar of life; the Rhisoma or the spring head of the arteries; the Primum mobile of the pulse and respiration; which being lively, the whole body is lively; if faint, all the parts are faint; and if it perish, the rest of the body perishes.

7. And although the heart is but one in all animals, yet it may be divided (D) into two parts, the right and the left.

8. The

8. The right resembles the form of the moon increasing, and it receives blood from the *vena cava* flowing into it; and prepares it, and makes it more perfect; and so distributes it partly into the lungs, for their nutrition; and partly into the left side of the heart, by passages not altogether occult, and as it is with the matter of vital matters.

9. The left hath the form of the Crest of an Helmet, and is more overwhelmed into the substance of the heart, containing the vital spirit begotten of pure blood, distributed by the artery Aorta into the body, and again receives the air out of the lungs by the venous artery.

10. And both these sides have their vessels, two whereof appear in the right side, and so many in the left.

11. In the right indeed there

are two veins, the *vena cava*, and the *vena arteriosa* : in the left there are two arteries, the great artery, and the venous artery.

12. There is a certain partition, which divides either side; the vulgar call it the seventh medium, which at the first sight appears crass; but after a more curious inspection, it is found to have many holes in it, that there may be an easie passage from the left side to the right; notwithstanding what the Neotericks exclaim against it, and urge to the contrary.

13. Furthermore there are certain appendixes membranous, and full of windings, leaping to each side of the ventricle, which are called *Auriculae*, not from its use or action, but similitude.

14. On the right side, it lies open to the door of the *vena cava*; the left is placed in the orifice of
 O the

the venous artery : and it is larger , because it is the receptacle of gross blood ; the latter is the less, because it contains air.

15. The chief use of those Auriculars are , First, that they be ready receptacles of blood and air ; that they do not confusedly pass into the heart , and so to suffocate the heart by oppression : Secondly, lest the *vena cava* , and the venous artery be broken in violent motions ; for they have great force in drawing of blood and air in to the heart.

16. The lungs (E) are of rare parts, light and spongy , and as it were concreted of spumous blood ; like the substance of a Snail, seated in the thorax, filling its whole cavity ; the instrument of breath and voice.

17. And although it is but one in body, yet it is divided into two parts by the membrane
called

called Mediastinus, the right and left.

18. Either part consists of two Globes or Knots : the one superior, the other inferior ; often discernable, and sometimes obscure.

19. The use of these is, that its flesh or substance should not be collaberated or tyred ; but that it may be more actively moved, and that the heart be embraced on every side.

20. The air is transmitted into the lungs by the asper-artery, whose structure is constituted of Veins, Cartilages, Membranes, and Nerves.

The Commentary.

(A) **D**iaphragma hath divers appellations ; for it is sometimes derived from the verb Diaphratto, that is, to fortifie ; because Diaphrattei, that is it

separates out the middle and low belly ; and also it is called the seventh transverse : it is called Diaphragma, and by ancient Medicks called Phrenas, because as some judge by its inflammation the minde is hurt. Its use is noble ; for it separates between the spiritual and vital bowels ; and the heart and the lungs, from the naturals : which separation *Aristotle* thinks to be made by nature, lest the vapours, which do exhale from meat, offend the heart, in which the soul, he thinks, doth reside : But this opinion is false, because the fumes do pass by the Oesophagum. To conclude, the Diaphragma hath two holes placed in organs ascending and descending. Again, it helps expiration and inspiration : for when the thorax is contracted, then the inspiration is dilated ; but when it is relaxed, then inspiration

ration is made. Again, it helps the ejection of the excrements by its motion, with the muscles of the Abdomen. Again, it is the rise of the organs, whereby it pleasantly affects the heart, and causes laughter.

(D) The covering which defends the heart, and contains it in its seat, and hinders it lest it should be oppressed with its vicine members, is called *Capfula*, which contains also a certain watrish humour, lest it should conalesce, and dry with too much heat: the substance of the heart is hard and dense, lest it should be broken by its violent motions: Its substance, saith *Aristotle*, is thick and spiss, into which heat is received strongly; and therefore its temperament is the hottest of all the members: it is endowed with three kinds of fibres; strait, crooked, and transverse

verse; that it may both draw, contain, and expel. Now *Aristotle* thinks these fibres to be nerves, and the principle of the nerves to be in the heart: but he is deceived; its figure is Pyramidal, but not absolutely so in brutes, but it is more flat then in a man: it is placed in the thorax, as the safest place, and on the left side thereof.

(C) This is the shop of the vital faculty; and therefore it is rightly called by *Aristotle*, the first thing that lives, and the last that dies: by its perpetual motion and heat, it begets vital spirits; for when it is dilated (which motion is called *Dyaftole*) it allures unto it, and draws blood, by the benefit of the strait fibres, from the *vena cava*, by the venous artery: but when it is constricted, which is called *Systole*, it sends blood from the right ventricle

tricle into the lungs, by which they are nourished, and that by the venous artery: but the vital spirit out of the left, by Aorta into the whole body; and both ways it converts into vital spirit, by attenuating the pure blood into vapour.

(D) There are two remarkable ventricles of the heart, the right and the left: between these there is a partition, which distinguishes the one from the other, which whereas it is crass and firm, it is not rightly called by *Aristotle* the third side, or belly; but lest that the passages may seem to be made by this, it sends out blood into another ventricle by narrow pores.

(E) The lung is called by the Greeks *pneumon*, a *pneo*, which is to breath, because it is the organ of breathing: therefore the lung ought to consist of such a substance,

stance, that it may be filled and distended with air, like a pair of bellows. The primary Cause of which action is its proper substance, which helps the motion thereof : for when it is dilated, it draws air, and by the vena artery carries it to the heart; by which the heat of the heart is allayed, and the vital spirit, as with food, thereby cherished. The figure of the Lung resembles the hoof of an ox, which is divided by the *Mediastinum* into two parts : it is the organ of voice; which I prove, because no animal hath a voice, that hath not a lung : there are some that say, that there are two lungs : but truly it is but one, divided into two parts, the right and the left. And again, both the parts consist of two Globes, the one superior, the other inferior; sometimes seen open, and sometimes shut :

shut: the use thereof is, that it may be moved more nimbly, and so amplex the heart more easily.

CHAP. 13.

Of the parts of the Animal faculty.

1. **V**VE have spoken sufficiently of the parts of the middle belly. Now we proceed to the organs of the supream region, serving the animal faculty; and they are such as are contained in the brain.

2. The brain (A) is a soft part, white and medullous, fabricated of pure feed and spirit, involved, as it were, in folds, compassed about with a thin skin, and contained in the cavity of the brain, the principle of the animal faculty, &c.

3. And this is the highest of all the bowels, and the next to heaven: this is the tower of the senses, the highest pinnacle, the regiment of the minde.

4. For the brain is not onely the seat of sense, but the artifex of motion, and the house of wisdom, memory, judgement, cogitation; in which things, man is like to God.

5. Therefore nature hath exceedingly fenced it, not onely by enrolling it within the skull, but also by covering it with other parts therein contained; which are two membranes, whereof the one is called *dura mater*, the other *pia mater*.

6. *Menynx* or *dura mater*, is an exterior membrane, hard and cuticular, covering the brain, and fencing it on every side.

7. After that is taken away, the *pia mater* is visible, which is

a tender membrane, the immediate and next cover of the brain; not covering the exterior superficies onely, but going deep into part of the substance.

8. But its substance is thin, that it may insinuate it self about all the sides and parts of the brain; and thin also, because it need not be troublesome to the brain, neither in gravity nor weight; and that it may deduce the vessel through the whole body of the brain.

9. But the whole body of the brain is divided into two parts, the anterior and posterior.

10. The anterior, by reason of the magnitude of it, obtains the name of the whole, and is properly called Encephalon, the brain.

11. The posterior is called Pa-
cencephalis, that is, *cerebellum*;
which seems to be formed by na-
ture,

ture, for the succor of the former, that it may keep the animal spirit transmitted from the ends of the brain, and that it may be adapted to the marrow of the back.

12, The brain above the anterior hath two cavities, distinguished clearly by internals, called ventricles.

13. And these are the receptacles of the spirits, which are daily brought out of the heart by the artery; and in them they are made more lucid, like to celestial flames of fire, and that for the better perfecting of the animal actions.

14. And they are three in number; the right, left, and middle: the two formost are called by some, anteriors; but more properly, superiors.

15. The dexter therefore consists in the right part of the brain,

brain, reaching over the whole length of it, from the anterior to the posterior; resembling the figure of a half circle: its use is the preparation and generation of the animal spirits.

16. The left consists in the left part of the brain; and it hath the same form, seat, and use with the former.

17. Whence experience doth testify, and the observation of Physicians doth confirm, that if the brain be violently compressed, or the ventricles bruised, that then the animal must needs be deprived of sense and motion.

18. For they place in these superior ventricles, common sense, which doth discern the objects of divers senses.

19. The middle or third ventricle is nothing else, then the concourse or common cavity of
of

of the two former ventricles.

20. This doth produce of it self two passages: the first whereof receives phlegme, the latter is extended to the fourth corner or bosome.

21. They place also in it, the faculty of imagination and cogitation.

22. These are the three ventricles of the anterior part of the brain: the fourth is common to the *cerebellum*, and the marrow of the back: the last, yet the most solid of all the rest, because it receives the animal spirits from the former, and so transmits it to the marrow of the back.

23. This is the place where they say the memory is contained.

The Commentary.

(A) **T**He substance of the brain is soft, and medullous; and they say it is so called, because it carries the substance of marrow: but it differs much from that marrow which is found in the cavity of the bones, because it is neither to be melted nor absorbed, as the other is: its use is famous and noble; for in this consists fear or courage, as also a voluntary motion of the senses, without which man stands as an image or pillar. And it is not onely the place of sense and motion, but the house of wisdom, and the shop of the cogitations, judgement and memory, whereby man comes to resemble God. And lastly, it is the treasure of the animal spirits: therefore by right the brain is the
no-

noblest of all members ; whose excellency if *Aristotle* had known, he would never have written of the nobility and dignity of the heart.

(B) Whereas in the opinion of *Plato*, the brain is the first and common sensery ; The question will be, and it is full of intricacy and obscureness , whether the brain be endowed with the sense of feeling ? It is the general answer of modest Physicians and Philosophers , that the substance of the brain doth want sense, though it be stirred with a daily motion ; but the membranes which encompass the body of the brain, are endowed with a most exquisite sense. But some will say , how can the brain be void of sense , and yet be adjudged the principle of sense ? this is a *non sequitur*. If the heart, according to *Aristotle*, be the principle
of

of the motion voluntary ; shall we therefore say , that it is moved by the arbitrement of the will, when it is rather moved naturally ? so the brain communicates sense to other members, therefore it is endowed with sense ; this is a *non sequitur*. Again I answer , that Theoreme to be true in logick , onely in Homogeneous causes ; and those also that are conjoynded, and not remote : for the senses do not remain in the brain immediately, but mediately, by the benefit of the nerves, which arise out of the brain. Yet *Scaliger* answers, the brain to have the force or faculty of sense ; *dynamis*, but not the act.

C H A P. 14.

Of the Species of Animals, viz. of Beasts, and they both perfect and imperfect.

1. **H**itherto of the parts of an Animate body: the species and differences of animals do follow.

2. Therefore an animal is either (A) *Alogon*, or *Logicon*.

3. *Alogon* is called a Beast, and it is an animal wanting Reason, and onely endowed with Sense.

4. But here (B) some go about to make a noise in opposing this, both ancient and later writers; in declaring, that certain beasts, by a singular sagacity and art, may be obstupefied by artificial operations, that they will act those

those things which cannot proceed from them, but they must be endowed with some prudence and reason; and besides their particular sense, something that deserves to be ascribed to reason.

5. Its true, they are endowed with some remarkable actions; but we must not conclude them to proceed from any reason in them, but from a natural instinct.

6. And how can Brutes be said to have common reason, when reason is a faculty of the soul, which doth move and busie it self to finde out causes from the effects; and again, from the causes to those effects which are the causes of them?

7. Furthermore, beasts are either perfect or imperfect.

8. They are perfect, (C) which have a perfect body in substance, and not in shadow, and endowed

ed with blood, procreated in them.

9. And they are such as either go or flie.

10. They are terrestrial, which draw in air by inspiration; and they continue out of the water upon the earth, or at least receive their nutriment most part from thence.

11. And they are either such as go, or creep, or fly, *Arist. 1 de Hist. An. c. 1.*

12. They that go or creep, are such as move on the face of the earth.

13. And they are either four-footed beasts, or creeping vermine.

14. Fourfooted beasts are those, that go upon four feet, or at least consist of four such parts: as man hath two arms, for two former feet.

15. There is a diverse constitution

tution of these, as also of the temperament of man : for in Dogs, choler doth abound ; in Hogs, phlegme ; and in others, other humours : whence their temperament doth chiefly depend.

16. Fourfooted beasts are distinguished by the manner of their generation, in *oviparas*, and *viviparas*.

17. Those are *oviparae*, which bring forth eggs, or breed after that manner, out of which afterwards the animal is produced ; as Frogs, Crocodiles, Lizards, Salamanders, Chameleons, and Serpents ; all which are endowed with four feet.

18. Although these in many faculties of the soul, and parts of the body, have no little similitude to man ; yet they differ much, nay more, then such as are born alive, called *viviparae* : for
neither

neither do we see the same ingenuity in them, which is in these, nor altogether the same parts and strength of body.

19. *Viviparæ* are such as bring forth perfect animals.

20. And those have a large lung, dense and carnous, filled with blood; and therefore they breath.

21. The yong also (D) is nourished and brought almost after the same manner, in the bellies of their damms, as the childe in the womb of a woman.

22. Therefore erroneous is that opinion of *Avicenna*, *Albertus*, and *Cardan* himself; who think that all animals that are gotten in the matrix, may arise without it, meerly of putrefaction: if so be it be true, that animals do proceed from a mutual copulation onely; but never any man, or dog, did ever proceed from

from putretude, but seed, *Scal. Exer.* 193.

23. *Viviparae* are wont to bring forth, either those which have solid feet; as an Horse, or Ass, and many others which want horns: so likewise many cornuted beasts; as the Ox, Hart, Goat, and the like; or such as have their feet divided into divers parts; as Dogs, Apes, &c.

24. And their yong are *multifarious*, for the many cells in the womb, where the seed is contained.

25. Creeping beasts (E) are those which crawl upon the ground; and they are either Serpents, which by convolving themselves, do move; or all other kind of worms upon the earth.

26. Furthermore (F) there are *volatile* beasts, which do use to fly much in the air; and they are otherwise called birds.

27. **Aereal**

27. Aereal birds (G) have by nature two feet , and they do move themselves above the earth by their feathers by flying.

28. Their bodies do consist like to other bodies , of the four elements of a legitimate commixtion; and they have both similar and dissimilar parts.

29. Yet they want reins and bladder; whereby it happens that they never urine , because they drink little ; and by reason of the heat and dryness of their nature, which converts their water into aliment.

30. Their generation is of an egg, and chiefly of the white ; for it is nourished by the yolk, till it is excluded : these eggs engender and do receive life from the heat of the damm, sitting upon them.

31. And they are sooner hatched in summer, then in winter. Hens in summer usually sit but eight

(265)

eighteen days; but in winter
twenty five.

32. And unless they bring
forth, they labor under a disease,
and perish.

33. Birds (H) are distinguish-
ed by their meat: for some are ve-
ry carnous, because as they feed
upon flesh; as those which have
crooked claws, as the Crow and
Hawk; and some are fed by
worms, others by herbs, and some
by fruits.

34. So much concerning Ter-
restrials. Now concerning such
as live in the water; and they are
called fish.

35. Fish (I) is a sanguineous
animal, of cold and warrish sub-
stance; of a long body, and squa-
mous skin, diving in the water.

36. Their propagation is much
by seed, onely this difference:
some lay eggs, which are commit-
ted to the water, and thereby

cherished : others bring forth their yong alive ; as the Whale, Dolphin, and the sea-Calf.

37. In the time of copulation, male and female are conversant ; and the female, by a gentle touch, conceives eggs in the matrix ; but they are not perfected, till they be sprinkled with the seed of the male : for these eggs, into which the seed is ejected, do become fish ; the rest remains barren.

38. Of the particular parts of Fish, these things are to be observed : There is a heart in most of them ; but inverse, or much turned in, contrary to other animals ; whereby a certain passage is made to their gills, by which they return the humor, which they receive into their mouths.

39. All their teeth are serrated : yet some have teeth upon their tongues,

40. Their

40. Their tongue is hard and almost thorny, and so adhering to the roof, that they seem to be without a tongue.

41. They have the parts of hearing and smelling; but none of sensuality but the eyes: for the passage is broad and open; where they should have that sense; their eyes are without lids.

42. They want lungs (K) and asper arteries; therefore they neither have a voice nor breath.

43. Aristotle proves it: First, because in breathing, water must be drawn in as well as air, which two bodies, do mutually hinder themselves: Secondly, because they do not move any particle of the belly, as other breathing creatures do: Thirdly, because when they dye in the water, we cannot perceive any bubbles to be made; which happens

when there is any animal that breathes, suffocated in the water: Fourthly, because if it were so, other animals also might breath in the water; which experience denies.

44. But some ancient writers and Neoterick Philosophers, defend the contrary opinion; who conclude, that all manner of fish do breath.

45. It is not for the former Arguments onely, that we pass from the doctrine of the Peripateticks, but also *Julius Scaliger* defends it.

46. But some fish do only live in the waters; some partly on the water, and some partly on the earth.

47. Those that live in the water, are either those that have blood, or are without blood.

48. Those which have blood are properly called *Pisces*.

49. And

at 149. And those are great,
small, middle, or little, accord-
ing to their adjunct quantity. At
150. Those are called great, the
Whale, the Salmon, Dolphin,
and sea-Calf.

51. Those that are of the mid-
dle rank, the Eel, Pike, Carp,
Perch, Stockfish, Tench, &c.

52. The least are these, a
Horsebeetle, Turdus, Sprats, &c.

53. Those that are called Ex-
sanguines, are such as are without
blood, and do consist in its stead
of a certain vital humors; and
these are either soft or hard.

54. Those that are soft, the
ancients call them Molluscas; and
they are those that neither have
scales nor a rough skin, as the
Cuttle, Calimary, Lollium, Por-
lipus, sea-Wolf, &c.

55. They are called hard
which have a crustaceous and sca-
lous skin, as the Crab, Muscles,
and Oysters.

P. 301 56. And

56. And amongst the rest, it is doubtful whether those that are called Amphibia, what their natures are (they have lungs and breath) and also whether they sleep by the mouth, or fistula; in the water, or out.

57. And they are partly four-footed, as Frogs, Crocodiles, Otters, Badgers: partly reptile, as the Water-snake; and partly aerial, as the Cuckoo, Wild-ducks, &c.

58. And thus much of perfect Animals: those that are imperfect are such whose bodies do not cohere, but they may be said to be divided, and they want blood, and have their origin from putrefaction, and are called Insects.

59. Therefore an Insect (L) is an imperfect animal, wanting blood; having a body distinct by its open junctures, &c. so likewise breathes not.

60. Whence

60. Whence these Insects are said to consist of three chief Parts ; the Head, Belly, and some Space between both.

62. Some of these Insects (M) are ingendred of ~~Caner~~ earth, and putrid slime : As for example, from putrid dung and wood, the Palmer-worm ; from putrid water, Gnats ; from mire and dirt, Worms ; And some from the putrefaction of a dead carcass ; as the Beetle from the Ass, Bees from the Bull, and Wasps from a Horse.

63. The cause of those that take their original from putrid matter, is celestial heat diffused in the ambient air.

64. Of them which are gotten of a mixed or cadaverous putrefaction, they are procreated of the proper heat of the mixed putrefaction.

65. This the Philosopher in-

deavored to find out, when he said, In those things that do putrefie, are animals procreated, because of the natural calidity existent therein, which being segregated makes a body.

66. Therefore that calidity so segregated, doth dispose the matter, and doth produce both a form and substance of the same, not by its proper force, as though an arridous could effect a living substance, but by the concurrence of the celestial heat.

67. And as the putrefied matter is diverse and various, into which the heat, both mixes with it self, and that which is by the influence of the heavens descends into it; so it must needs produce divers and various Insects, and they both noble and ignoble.

68. For if the matter be very terrene, then testaceous animals

are generated. If tender and sub-
til, then more flender animals
are produced.

Hence it is that when there is much terrene portion in the sea excretion, that of such a concretion, a shelly substance to arise; so that the terrene part, doth quickly indurate, and coagulate.

But there are two kinds of insects: some are winged, some not.

Amongst those that are winged, there are some that have two, and some four wings.

Those that have two wings,
such as birds, flies, etc.,
are not to be compared with
those that have four wings,
such as angels, etc.

Four species of bees
Halictus, Graptobea, Bees,
and other insects.

71. The 1924 was a very
 1924 was a very
 1924 was a very
 1924 was a very

73. And amongst these, there are some that walk by degrees; as the Pill-mire, Spider, Horse-lice, Locusts, Fleas: others crawl slowly on the ground; as Worms, Grass-worms, Glow-worms, &c.

The Commentary.

(A) **B**etween a rational Creature, to wit, a man, and an irrational, to wit, a beast, there is a certain Medium, called a Satyre or Ape, which is rightly referred to monsters.

(B) Some things are here to be touched, concerning the reason or intelligence which seems to be in Brutes: For there are some now in these days, who beside that particular sense and reason they attribute unto them, do believe that they are moved with a certain singular sagacity and docility, in wonderful operations;

with

which they say cannot be acted without some prudence and reason. For the great *Bucephalus* of *Alexander* would permit no body to come upon his back, but his Lord; and at last one putting on *Alexanders* Robes, and mounting thereupon, was notwithstanding immediately thrown off. *Nicomedes* is reported to have had a Horse, who when he perceived his master to be lost in the battel, he refused to eat his fodder or provender, but pined away and died. The Panther, after that it hath tasted of poyson, presently runs to mans dung, that it may be thereby helped. The Goats in the woods of *Crete*, being shot with darts, runs to the herb *Dintany*, and thereby have their darts plucked out. Swallows also shew a wonderful art, in building of their nests with clay. Bees, in the making

King of Wax and Honey: And
 for many other Beasts several o-
 ther performances, which can-
 not be imitated by us; all which
 seems to some to be acted with
 reason. But for true solution of
 this, between the true actions
 of Reason; and the sensitive Fa-
 culty; for the Operations, Per-
 formances, and Actions of Brutes
 are not to be adjudged as pro-
 ceeding from reason, but partly
 from the instinct of Nature,
 partly from a Phantasie, and
 partly from a natural sagacity, or
 that daily assuefaction they per-
 form. And though we should
 grant; that these Actions do
 proceed from a certain kind of
 force or faculty of discretion or
 prudence; existent in Brutes; yet
 it is different far from humane
 discretion and reason; neither
 doth it differ in quantity, at more
 or less; but in the quality of
 thing

thing in itself: for it cannot properly be called reason, or be comprehended under the name of a rational faculty, but to be understood Analogically: for it is the property of reason, not onely to understand, know, and judge of its action, but to vary the same, according to its will: but Beasts can do neither of these for those things wherein they are always occupied, in them they do continue, and from them do not depart: neither can they vary their action as will as those that are endowed with reason. 20

But some will alledge, first, that Beasts are capable of Discipline, because they are taught many things, and to perform many works, therefore they are competent of reason: if by Discipline they understand Science properly so called, I deny that ever any Beast was ever capable

of any such Discipline: For though they may learn ^{to sing}, yet they cannot learn ^{else}: and therefore there are certain Birds, which learn to speak by a certain custom and inclination; but what they say, they are altogether ignorant.

Secondly, those that are fallen into frantick fits and madness, may be said to have had ratiocination, and understanding: but many Bruit beasts are said to be mad; as Apes taken in drunkenness, Dogs often run mad: The Ox, Horse, Ass, Camel, are said to suffer diseases, which Physicians rank in the regiment of madness: therefore, &c.

I answer, it cannot truly hence be gathered, that Bruits have any similitude with mans reason; for men are said to be mad, when they are void of that reason which distinguishes them from a Bruit.

Now

Now Brutes are mad, according to their internal senses, which are common to them, to wit, imagination & sensitive faculty, which some call *cogitativum*, and *estimativum*: For Madness, Phrensie, and Melancholy, are Diseases that cannot hurt corporeal affections by themselves, to wit, simply alone, but corporeal faculties also; for they disturb the mind by accident, because it is contained in that very house or situation, where this distemper reigns, and where the senses are used. But Brutes suffer madness, by reason of imagination or their estimative faculty; not for their reason or understanding.

(E) It is common to all perfect animals to have blood, and therefore without it, they neither can be accounted perfect, or produce any vital action; for blood is after a manner another soul.

(D) It is a thing common almost to the Universal Genus of fourfooted Beasts, that their generation proceeds from the commixtion of the Masculine with the Feminine, and they copulate either at certain times or seasons, or promiscuously at any time. And whereas they are void of reason, especially when they have a sensual appetite thereunto; at which time, the Male is so furiously inflamed with such an irresistible light, that it will furiously assail the Female, and prosecute her, untill his appetite be satisfied, as we see often verified in Snags.

(E) All Serpents are related to fourfooted Beasts, because they have Blood, Flesh, Nerves, and other internal Bowels, of that Nature with them, though not so perfect, and also dissimilar from the members of those

those animals. This animal is crafty and wise, in the preservation of its life, in seeking out a Den to lurk in, and Food to live on.

(F) Volatiles do consist of all the elements, but chiefly of water; which we may read and prove by sacred writ, where it is said, *That the waters brought forth both creeping things on the earth, and flying things in the air*: where a question will arise, why God produced flying things out of the water, rather than the earth? Because the greater part of them do reside upon the earth: For upon the earth they feed, sleep, pull off their feathers, and altogether haunt the earth and not the water, because, according to *Aristotle*, we are nourished by those things of which we consist. Birds consist of earth, rather than water; therefore, &c. This argues that their substance is hard

and

and dense, which must needs differ much from the nature of water, but little from earth. But for the further solution, we must know that there is no animal gotten, or procreated in the fire or air, but in the water and on the earth all Bodies are procreated, and that of the commixtion of siccity with humidity; but of the two other Elements, they receive light temperaments and virtues; therefore, because Birds are wandering animals, they ought to be framed of an Aery temperament that it may be consentaneous to their nature. Now Birds are procreated from the water, which comes nearest to the nature of air, for it is made air, extenuated by heat, as we see the density of air to pass into water; and therefore Birds are produced out of the water, into the air, as it were a proper Element for their nature. (G) When

(G) When in the definition, we say, Birds to be two-footed and winged, this ought to be understood of perfect Birds; for there are certain Birds found without feet, called Apodes, and also without feathers, of which see *Scaliger*: and it is called a Bird from *Avia*, because it cuts an uncertain flight in the air. For there are three things uncertain, and past finding out: the way of a Ship in the sea, the way of a Bird in the air, and the way of a Yongman on earth.

(H) Other divisions there are of Birds, of which see *Scaliger*, *Exer. 227.* and of the species of Birds, see *Freigen* his *Physicks*.

(I) By Fish I generally understand all water-animals, that swim in water, and all these are produced of the water: which their natures doth demonstrate; for if they be taken out of the water

ters; they die and perish, because they are robbed of their proper Nature or Womb; but in water they grow and are nourished; by reason of the similitude and regulation of their Nature with the place, which is cold and moist.

But how can Fish; which seem to be constituted of incoherent Matter; and a ligated body; be produced from water alone, one simple Element, and fluid; as the Passover, first, the concretion of water in the producing of fish, to be done forthwith by the voice and command of God; in so much that it is so constricted, and firmly coagulated, that the body of fish is solid and well compacted. Again, we do not deny, but that other Elements concur to this aquatical constitution; but water hath the dominion, whose nature fish emulates, because they are cold and moist: where not
with-

withstanding we must observe
that this same watry constitution
doth participate of heat and moi-
sture, in which the vital faculty
or life doth consist.

(K) It is an old tossed question,
whether fishes that want a lung,
breathe? *Aristotle* denies it, but
Plato and all the ancient Philoso-
phers affirm it; and these are
their Reasons: First, what ani-
mals soever have not the organs
of respiration (so called) cannot
breathe; but fishes have neither
lungs nor arteries, which are the
organs of respiration in all other
animals: therefore fish breathe
not. Secondly, if fish do breathe,
it must either be by the mouth,
or fins; and then they both re-
ceive and let out the spirit to-
gether: but this cannot be, be-
cause these motions are contrary
in themselves; and contraries
cannot act together in the same:
there-

therefore fishes do not breathe. Thirdly, if Fishes that are destitute of attractive arteries and lungs, breathe, then they must breathe by the benefit of the belly; but this is absurd; therefore the consequence false: The reason of the Minor is, that if the belly of fish doth attract air, then it would do so in other animals; but it is not so, therefore, &c. Fourthly, In all those animals that inspire and expire, some part of their body may be discerned to move; as in man, when he breaths, the breast is lifted up; if he expires, it is pressed down: but in fish there is no such motion to be seen; therefore they breathe not. Fifthly, when any breathing Creatures are suffocated in the water, certain bubbles will arise, if they be there detained till suffocation; but if fish be never so long detained, they cause

no bubbles, therefore they breath not, neither do they receive any extrinfecal air: Sixthly, if fish did breath under the water, it would follow then, that men and other animals might breath also: but the consequence is false, therefore the antecedent: Seventhly, if fishes do breath in the water, then it is so that they may attract air, which they must do also without the water; but they do not breath out of the water, nor attract air, Ergo, &c. if all animals do breath, then insects also should breath, which are animals; but they breath not, Ergo, &c. the assumption is confirmed; for those animals that breath, do breath whilst they live, and when they cannot breath longer, they cease to live. But insects do live, though they cannot breath; for when they are cut in two parts, they will live
in

in each part: whereas it is not possible, that all the parts of an animal should breath.

Observe, this last Argument, to impugn all the Ancients opinion: Fishes do therefore breath, because the life of animals consists not without breath. These are the reasons of *Arist.* denying fish to breath. But because there is a heart in them, therefore they have need to have their heat tempered; and that it may be so tempered, they draw in by their gills, water for air, and let it out by the same. For as in man, the lungs and the thorax are lifted up and down in breathing; so the gills of fish are dilated and contracted, in drawing in of water to temper the heat of the heart: for when the gills are dilated, they draw in some small portion of water, which is conveyed by certain passages to the heart.

heart; which cools the heat thereof; and when their gills are contracted, the water again is expelled.

Some do stiffly oppugne these opinions; whose reasons we shall now consider of: First, a Fish is an animal; therefore breathing is necessary, because it hath need of air.

I answer, If by breathing or respiration they understand refrigeration, then the consequence is to be received; but if they mean the attraction of air, I deny it: for the spiration of air is onely competent to those animals endowed with lungs; but Fish may be refrigerated by that water, which both they draw in by the mouth and gills. Secondly, Air is contained under the earth; therefore under the water; and by consequence, fish do attract it, and so breath.

Q

Ans.

Ans. I deny the consequence: though air may easily pierce into the earth, which is porous, cavernous, and dry: yet into the water it cannot pierce, because of the fluidness of its body, being so easily reduced to unity, and so closely gathering it self together, that there can be no vacuity for air: for if a Staff be thrust into the water, and drawn out again, there will be no hole left, or resemblance where it was, but will forthwith rise up, and swim at top: But if it be fixed into the earth, the hole where into it was put will remain, which is immediately filled with air; and therefore it is that the breathing faculty of Moles under the earth, is not taken away, because they always make a hole, whereby they receive breath. But now in water no pores or passages can be apprehended, where-
by

By air may be attracted; therefore it is impossible that fish should breathe therein. Thirdly, Fishes do breathe by their gills, therefore breath is drawn by them, though not in the usuall manner. I answer, that some spiration is manifest or perfect, some obscure and imperfect: 'Tis manifest in those animals that are endowed with the organs of spiration; and then it is properly called respiration: but that distillation of the fishes gills, is more rightly termed transpiration, and onely answers by Analogy to the true spiration: for as their parts, *viz.* lungs and gills, differ in species, so also their functions differ: for as the wings of Birds and fins of fishes do agree analogically in themselves, as to the efficient cause, *viz.* of motion; yet they are not of the same Genus, because fish by their fins

do not fly, as birds by their wings, but swim; so those gills that are given to fish in stead of lungs, are not of the same species with the lungs of animals. The fourth is taken from Experience: if fish be put into a vessel with a narrow orifice, filled half full of water, and so the mouth of the vessel stopped; there is so great a desire in them of the injoying of the air, that they strive who shall be uppermost, swimming one upon another, for no other cause then a desire to be next the air. *Scaliger* answers, the reason of their so much struggling, is not for the injoyment of air, but the avoiding of their close imprisonment; endeavouring to finde a way out of the vessel, to free themselves from that scarcity of water, into a place of more plenty and liberty. Fifthly, if a vessel full of water, and with a narrow

row orifice be closely covered, the fish that are enclloistered within, are suddenly suffocated; because no air can come unto them; therefore 'tis absolute necessary for fish to breathe under the water, for the preservation of their lives. This, if it be true, I thus answer: If so, then it may be judged to happen rather from the defect of the celestial light, than air; for thereby force and heat is added by the influence of light: for all animate things stand in need of this celestial spirit, for the preservation of their lives. Again, if it be so that fish included in a vessel are suffocated, it must happen that the water being deprived of air, loses its nature (*Scaliger Exer. 275*) for it is preserved from corruption by the air, as from a superiour form; therefore it kills the fish. But to conclude, If fish should

die for want of air, how come they to live, where the waters are frozen all over, many thousands of paces together? or can they receive air through the ice? therefore the Objections of our Antagonists, are frothy and vain.

(L.) Insects are called by the Greeks, Entoma, because they have Bodies distinguished, some into two, three, and some more incisures; and they have in stead of blood, a certain vital juice or humour, which is Analogous to blood, which as soon as it is exhausted, they perish: And because those Insects want blood, their natures are cold, and therefore it is that they breathe not: for breath is given to animals by nature to cool the blood; and because those insects (saith Aristotle) want bowels, therefore they leave no respiration, because they

they have no convenient organs for that use.

But against this received opinion of *Aristotle*, *Pliny* objects, that Insects do breathe; which he maintains by two Arguments.

First, That many kinds of Insects do put forth a certain noise; as Bees, and those that want wings: others to sing; as Grasshoppers: so also Gnats & Flies make a certain buzzing & noise; which cannot be, except they received air.

I answer, When Bees and Flies make a noise, it happens by the agitation of the interior spirit, and not the exterior: for those Insects that seem to sing, as Grasshoppers, do make a noise from the agitation of the included spirits, fretting, as it were, against that membrane, with which their bodies are wrapped; for they do not make a noise by the attracting of spirit at the mouth: for they a-

alone in the Universal Genus of animals, by the observation of *Aristotle*, want mouths.

Secondly, Insects are endowed with smelling; but smelling cannot be effected, but with the attraction of air by respiration; therefore they breathe.

I answer, The Sense of smelling is far different in these Insects, from that in other sanguineous animals; for they have this censory hidden within the skull; and therefore they cannot perceive odours but by the conduct of the ambient air introsumed: But Insects do not perceive odours, by the attraction of air, but by the alone presence of the thing to be smelled at the censory; which organ in them is always open, and exposed to smelling, not unlike to the eyes of those animals that have no lids nor covering, but always open.

(M) The

(M) The material cause of Insects is double, as the Insects themselves are of two kinds; for some are gotten of slimy earth and putrid mud: as for example, from putrified Pot-herbs, the Canker or Palmer-worm; from putrid Water, the Gnat; from decayed Wine, the Midge; from Slime, worms; from Mud, frogs: others arise from a mixed putretude; as Beetles from the carcass of an Ass; Bees from a Bull; Wasps from a Horse. And as there are two kinds of Insects, so there is also a double efficient cause of them: for they which take their rise from putrid Matter, their efficient cause is the heat of the Sun, diffused in the Ambient air: But they which are gotten of a mixed and cadaverous putretude, are procreated meerly from the proper heat of the mixed putretude; for

that heat doth dispose the Matter, and produce a substantial form of the same, not by its proper force; for an accident cannot make a living substance, but by the vertue of the Celestial heat. But some may say, that heat of mixture is broken in putretude, if putretude be the corruption of heat natural; therefore the heat of a mixed body putrefied, cannot be the efficient cause of Insects.

I answer, In the natural decay of mixtures simply, all heat doth not vanish, so that none may be said to remain; but broken, as natural, and according to that measure, which is necessary to retain the humidity with the fixity: as in the destruction, death or decay of living creatures, all heat simply doth not vanish, but that onely which was convenient for the existence of the soul in the

the body, and the preservation of life; therefore that heat which is yet left in a mixed putretude, hath reason to be the efficient cause of Insects. But some may further instance, that heat in the generation of mixtures, ought to domineer passively, not actively; according to *Aristotle*, who saith, that heat and cold do generate when they overcome and rule in passives: but in putretude, the heat of mixture doth not obtain the name of dominion, because it wants strength and vigor, and is so unfurnished, that it cannot retain the moist with the dry, for the preservation of the mixture: therefore it cannot be the efficient cause of Insects, which Insects are procreated of the unity and consistency of humidity and fixity.

I answer, The heat of the body putrefied, may be considered

two manner of ways ; either in respect of that mixture which doth putrefie, or in respect of the animals which are produced from that mixture : if it be considered after the first manner, then it is preternatural, and not fit to retain the humidity with the siccity, because it doth not further rule in these passive qualities, but if heat be considered in the second respect, then it is natural, and hath force and dominion over the moist and dry, and it can terminate and couple them, and out of that matter produce a substantial form, by the concurrence of the celestial heat: but now as the matter is various and diverse, in which heat doth exercise its action; so likewise various and divers animals and insects are produced: for if the matter be much terrene and corpulent, then it will produce
 testa-

testaceous animals; but if tender, thin, and subtil, then heat doth generate slender animals; as Flies, Gnats, &c. For as *Aristotle* says, In the sea there is much of an earthly substance: and thence it is, that from the concretion thereof, so many shell-fishes are procreated. But again, it may be objected by some: Every thing that is generated, must proceed from a thing that is like to it self: for a celestial body and heat, are not similar to those which do arise from *cœnosa* and putrid Matter; therefore from these they cannot rightly be said to be generated.

I answer, Every thing that is generated, is said to be generated from its simile, either according to an univocal generation, or an equivocal generation by analogy. I call that an univocal generation, when one man begets another

another, or one dog another; for here the thing getting, and the thing begotten, are of one Genus: for the bitch generating is an animal, and the dog generated, is an animal: But an equivocal generation is made by similitude; as a frog, that is produced out of filth by the force of the sun; and it is so called, because the thing getting, and the thing gotten, are Heterogeneous. But now although the Insects proceeding from such like bodies, are not similar, according to the univocal Genus; yet they are generated *a simili*, according to the equivocal Genus by analogy, because they are produced by some existent act; as by a celestial body, or the like, which concur in the way of act to produce a body.

CHAP. 13.

Of Man and his Formation in the womb.

1. **H**itherto we have Treated
Of irrational Creatures.
Now we shall say something of
the rational, viz. Man.

2. Man is (A) an animal endowed with reason.

3. And as he is the most noblest of all Creatures, so he hath the most beautiful and excellent structure of body, of all other animals; being erect, and looking up to heaven.

4. But as every thing which is gotten, doth proceed of something, and from something; so there are certain necessary principles to the generation of mans Body.

5. The

5. The seed (B) therefore of both Sexes, is plentiful and fruitful, and pronounced by the ancients, to be the Mother-blood of principles.

6. The Seed is a humid body, spumous and white, generated from the flower or cream of the spirits, elaborated by the Insisted force of the stones for generation sake.

7. Hence it consists of two parts; of a watrish humidity, and spirit.

8. The Serous humidity is generated of blood; whence he affirms seed to be an excrement of the last sanguineous aliment, not in substance, but by a profitable abundance, *Arist. 1 de Gen.*

Anim. c. 18, 29.

9. The Spirituah part (C) is no other then the vital spirit, dilated by the spermatick arteries to the cods, where it is exquisitely mixed

mixed with blood, and of two becomes one perfect body: therefore the Seed is compounded of spirit and water.

10. Maternal blood (D) or *menstruum*, another principle of our generation, is a sanguineous excrement, begotten from the heat of the female, for the conservation of her species.

11. It is called menstruous, because it comes monethly; which nevertheless, after conception, is forthwith stopped.

12. It is called a sanguineous excrement, not that it is like thereunto, or noxious in its quality (as the Neotericks do affirm) but that it is too luxuriant in quantity; and therefore it is poured into the greater veins, from the fleshy parts, that are already filled and satiated.

13. Therefore this blood is laudable, and alimentary, whose effici-

efficient cause is the weakness of the heat of the woman.

14. For the female is always more colder then the male, therefore she cannot make all the last aliment, and convert it into the substance of the body; and therefore by little and little it is sent into the veins of the womb, that it may be excrened.

15. The time of excretion is not designed; but in many it begins at the fourteenth year of their age, and ceases about the fiftieth year, because then heat grows weak, and doth not longer generate the reliques of laudable blood, neither can it expel them if they do abound.

16. The use of this menstruous blood is very necessary, both that it may cause a conception, and afterwards nourish after conception.

17. Therefore feed is the principle,

ciple, from which, as it were the efficient cause, the conformation is made; from which, as from the matter, the spermatick parts are generated: but blood hath the name of the matter alone, and passive principle.

18. For of it are both the car-nous parts generated, and both the spermatick and carnos nourished.

19. But to the seed is allotted the nature both of the efficient and material principle, because it consists of two parts: for the efficient is by reason of the Spirits, on which on every side is poured; the material, by reason of the thickness of the body and crassament, of which the spermatick parts are generated.

20. And the seed is double; the one of the male, the other of the female: but the seed of the male is of greatest force.

21. Nei-

21. Neither do the Peripateticks altogether deny women to emit seed, as *Galen* and not a few more, have exclaimed against them: but as they say, they do not emit seed as men, neither have they such seed,

22. For women do put forth seed, but not such as men do, that is, not so crass, white, and full of spirit.

23. For when mans seed is poured out into the womb, it is exquisitely mixed with the womans, and is, as it were, in a fruitful field; and immediately upon the permixion of the seeds, the womb is gathered up together, and doth contract it self so close, that no empty space be left within.

24. Seed so (E) taken and strictly comprehended, is cherished in the womb, by its heat and ingential property, exciting its strength

strength lurking within it; and stimulates it to act, in so much that it breaks out into action.

25. This action of the womb they call conception, which is a promotion of the retained seed to duty.

26. The Signs of conception (F) are these: a tickling over the whole body, upon the meeting of the seeds; a retention of the seed, if the inward mouth of the womb doth exquisitely shut and open: a small pain wandering about the belly: if the Terms be stopped: if the breasts swell and grow hard; a nauseous stomach, and frequent vomitings.

27. Therefore the spirit of the seeds is used as an instrument for this divine faculty of generation, in going to the bottom, or centre, whereby the work of conception is carried on, and of which the conception it self is constituted.

28. This

28. This work cannot be made without ordination, position, secretion, concretion, densation, rarefaction, extension, contraction. *Arist.*

29. Therefore, when the spirit begins to act in the substance of the seed, consisting of Heterogeneous parts, it first divides its dissimilar parts: those that are thin and tender, and full of spirit, it hides within; those that are cold and thick, which arise from the seed of the woman, it covers without.

30. The middle and more nobler parts of the seed, are puffed up, or blown up, by heat and spirit, to the effiguration of the members.

31. The number of these membranes are yet undetermined: we reckon onely three; the first whereof is called *Amnios*, which is next to the yong, wrapping it from

from the neck to the feet, containing the excrements also with it; in which the yong swims, as it were.

32. The second is called *Alan-wis*; it is the middle between the first and the third, thin and narrow, onely going to the middle of the yong; and it is the receptacle of urine.

33. The third tunicle is called *Chorion*, and it is the outermost, covering the whole body of the yong, and adheres to the womb, by the interposition of the umbilical veins and arteries.

34. These 3 membranes mutually connated to themselves, do seem to constitute one tunicle, which is called by the Latines *secundina*.

35. The interior and subtil part of the seed, being enclouster-ed in these, and as it were environed, the formative vertue, and as it were vital spirit, of the same seed

seed (which contains in potency all parts, both similar and instrumental) doth coact together, and as it were delineated, so that the rude exordium of these parts, or at least a resemblance of them, may be seen; which is wont to be made in seven days.

36. For when the vital spirit, which is the framer of generation, is the same, and doth act in one and the same moment, disposed into the same matter, and altered by heat; what hinders but that this agent may decline all parts natural, once and again.

37. Yet there is an order observed in the formation of members; (1) one member is perfected before another.

38. And the more nobler and most necessary, the first of all; the ignobler, and least necessary, the last of all.

39. Therefore the formati
facul

faculty doth perfect in the first place, the spermatick parts of the male in thirty days, of the female in forty or fourty two.

40. Nor doth it hinder what some learned men do object, that so little seed doth not suffice for the constituting of these parts; for the sperme is appointed not onely to suffice the formation, but the auctiō also.

41. Again, if this sperme (which proves Abortive, or may be known by the section of the living animal) be cast into cold water, it will scarce exceed the bigness of a large Emmer.

42. The carnosus parts are framed after the spermatick delineation, from the other principle of generation, to wit, blood; which flows by the navel vein.

43. There are three sorts of flesh which grows in the bowels: First, the flesh Parentyng; Secondly,

condly, the flesh of the Muscles, which is called properly and absolutely Flesh : Thirdly, the peculiar flesh of every part : and it is likely, that these three sorts of flesh are not generated together, but in order.

44. For first of all, the flesh Parenchyma, which is the substance of the Liver, Spleen, and Biters; afterwards the peculiar flesh of every part; and lastly, the flesh of the Muscles.

45. And amongst the fleshs Parenchymate, that of the Liver is the first made, because the umbilical vein doth first pour blood into it, which concretes after fusion, and becomes flesh; then that of the heart; and lastly, that of the rest of the bowels.

46. So that the infant begins to be Dearticulated and absolute, after forty five days; living at first the imperfect life, as it were, of

a Plant, after the manner of an animal, and at last the life of a man.

47. And this happens not by reason of the form, which is simple and individual; but by reason of the matter, that is, of the organs.

48. But the embryo takes aliment onely by the navel; but after the liver is made, it ministers to all the members: but it doth not yet move, though it hath life, by reason of the imbecility of the brain and softness of nerves.

49. The weak and tender members of the infant, by little and little are dried by heat, and so made more solid; and then the yong begins to feel by perfect Sensories, and by and by to be moved in the womb.

50. But a man-childe doth move sooner then a female: for

boys, because they are conformed in thirty days, do move on the ninetieth day, which completely make three moneths; but because the female is framed in forty or forty two days, she moves not till the hundred and twentieth day, which is about the latter end of the fourth moneth.

51. And the infant is nourished, and doth increase all this space of time; and when it is ripe it is brought forth, partly by the endeavor of the womb (for it being burthened with its weight and abundance of excrements, it strives to be exonerated) & partly by its proper motion: for the necessity of breathing, the want of aliment, and the narrowness of the place, do enforce the yong to endeavor a passage out.

52. At the time of birth the doors are opened, which immediately after delivery are shut again.

again. This we see done, saith *Galen*; but how it is done, we know not; onely we may admire it: *Avicen* calls it a work to be wondred at, above all wonders.

53. The womb being opened, the infant begins to come out by the head: and by many painful throws, it draws out and brings with it three membranes: and thus by the prescript of nature, are we born into the world.

54. The time of bringing forth, is not fully defined, nor can it; for some are delivered at seven moneths end, some at nine, (and most then) some at ten, but seldom, and very seldom at eleven; but in the eighth moneths end, seldom any are delivered with a live childe.

55. And this is the manner of the Conception, Conformation, and Procreation of the noblest of Creatures.

The Commentary.

(A) **T**He definition of a Man delivered, consists of a Genus and Difference: As to the Genus, he is an animal; and as to the Difference, one endowed with reason: And in this it is that man hath a Prerogative, Dignity, and Excellency, above all other Creatures: for his minde, which is Divine, is the Image of God; and he differs much from other animals, and as it were exercises a regality over them: for are not Lyons and Elephants tamed by the strength of man, and overcome, and made subject to him? Man is created with his face looking up to Heaven, as it were contemplating upon God. Hence *Ovid* could say,

Prona

*Pronaque cum spectent animalia
cætera terram,*

*Os homini sublime dedit, cælum-
que tueri*

*Jussit, & erectos ad sidera tollere
vultus.*

For whereas God created all other animals with their faces downwards to the ground, man alone he creëts with his eyes fixed upon heaven, whither he should tend.

(B) The generation of man is made after this manner: the seed of both Sexes being perfectly mixed, the whole doth proceed from thence; therefore the matter of the generation of mans Body, is the seed both of the man and the woman, plentiful and fruitful. This seed doth consist of two parts, watrish Humidity, and Spirit: the watrish Humidity proceeds from the blood; whence *Aristotle* affirms blood to

be a profitable excrement of the last aliment, that is, of the sanguineous aliment: I say it is an excrement, not supervacaneous in its nature or substance; as Stones and Worms: nor in its quality; as Dung, Sweat, &c. but onely in its abundance or quantity: for because it superabounds from nourishing the parts of the body, and cannot be assimilated thereunto; it obtains the place of an excrement.

(C) The spiritual part of seed is no other thing then the vital Spirit, which by reason of this Spirit, it becomes hot: and sometimes this Spirit is ingendred in the heart, and thence sent out into the whole body: so doth the Seed also, according to the Spirit, proceed from the whole, because the Spirit is communicated from the heart to the whole: Hence *Aristotle* saith, if the Seed
did

did not proceed from every part of the animal, the cause of the similitude were false; therefore seed ejected by the yard into the womb, becomes fruitful, when it is exquisitely mixed with the womans seed; and it is the principal motion, that is, the first agent for the formation of the yong, by reason of the spirits contained in it: For this going to the bottom, as to its centre, is cherished and preserved, and so proceeds to action, as to formation: all which things are necessary for the framing of the yong; for besides the seed of the man and the woman, it is necessary that this vital spirit concur to the conception, because the seed of man cannot besmear all the parts of the womb, which else will impede conception: and if the seed of the woman be onely present, that will not cause conception, by rea-

son of its imperfection; for the seed of man is more hot then womans: and although this seed be not so perfect, yet it concurs as an agent to the formation, although not as the first agent: for as *Galen* observes, the mixture of the seed of man and woman, is perfect seed; whence *Aristotle* saith, that what arises from the seed of man and woman, do arise from contraries, as when there are contraries in the same Genus: and although each seed, according to *Aristotle*, is in its Genus an agent, yet they do not act alike in power and strength, but differ in these functions, *magis & minus*: the seed of the woman doth concur, as the matter of which, both by reason of the seed of man, which is its aliment, (for mans seed is nourished and made more perfect by womans seed) as also by reason of the

the membranes which are produced out of it. But in this place we may take notice, what the Peripateticks in a manner asledge, that the woman emits no seed: but they are basely and injuriously dealt withall; it is an aspersion cast upon them, by some later Philosophers, because *Aristotle* saith, That the seed of the woman is not so crass, while hot, and full of spirit, as the seed of man: but he doth not say, that women emit no seed at all.

(D) Besides the seed of both Sexes, the menstruous blood of the woman concurs to generation: it is called menstruous blood, because it is an excrement; yet it differs from that blood whereby a woman is nourished; and it is called excrementitious blood, to difference it from the seminal excrement; and it is an excrement of the second concoction, which
is

is made in the liver and veins; and therefore it is, that it hath a red colour: furthermore, that matter which is contained in the veins, and expurged by the veins of the womb, is this superfluous blood and excrement of the second coction: for whereas the Bodies of women are more colder then mens, they cannot make perfect their last aliment, nor convert it into the substance of the body to be nourished; whereupon, that which is above, and cannot be converted, by little and little, is thence conveyed to the veins of the womb, where it gathers together into one place; and what of it cannot be sustained by nature, is expelled. Its use is necessary: for as it helps conception, so it nourishes the yong.

But here a question will arise, how the yong, whilst it is conceived

ved

ved and framed in the womb, is gotten & nourished by this same blood, when it is endowed with a bad quality, and puts forth many ill affections?

I answer, This blood is not always so bad as is imagined: for those women, whose bodies are temperate, their blood also must needs be temperate; and when the body is vitious, the blood also must needs be infected. But again, this pravity in women, is purged away every moneth; and in them it is otherwise, then in those who keep their terms beyond their accustomed time: the former hath no noxious quality in it, as to hurt what is generated of it; which need not seem strange: but if the same blood be not evacuated at its accustomed time, but retained, it will stir up and cause many bad affections, as the suffocation of the matrix,

-trix, Appendix, and the like. But now if it be considered in a woman that hath milk in her breasts, it is otherwise; for then blood is conflated of a treble substance: for then the alimentary or pure portion of it goes to the nourishment of the yong, and part somewhat impurer goes to the breasts, and converts to milk; and the worst of all is contained as excrements in the tunicles, where the yong is enrolled: which is evacuated at the womans delivery.

(E) After the seed of both Sexes, together with the menstruous blood, is received into the womb, it closes up; and the seed therein contained, is cherished by its heat, and begins to act: the spiritual part of the seed passes to the bottom, and begins the formation; and of the crass part of the seed, the spermatick parts are

are engendred; and of the menstruous, the sanguineous parts.

(F) The Notes of conception are these: The close shutting up of the womb; A kinde of trembling and tickling over the whole body; And after that, an exceeding refrigeration; Loss of stomach, Nauseating of victuals, Vomitings, &c.

(G) Generation is made by the mutation of the power into the act, and an artificial composition of many existents in the act: the Soul is the act of an organical body: but the seed is not the organ, therefore not the animate; then the power above will be the animate: for as the Sun, not hot, doth calefie; the Whetstone not sharp, yet doth sharpen: so also the seed may animate, that is, the yong is animated by the seed, although there be no soul or life in it.

(I) It

(1) It is a great and difficult dispute among Physitians and Philosophers, in what order the parts of the yong are framed? some think the liver first to be generated, others the heart, which they say is the first that lives, and the last that dies.

In this Controversie we are to observe, that neither the Liver nor the Heart, nor any other principal member, nor umbilical vessels are generated first, as divers have judged several manner of ways; but that all are inchoated in one and the same moment, and that for this subsequent reason: The vital spirit, which is the efficient cause of the generation, and the internal natural agent, nor the external voluntary, hath the whole formatrix faculty, in every part where it is joyned to the matter fitly disposed: it must necessarily act *secundum potentias*;

tentias ; and therefore all the parts of the body are produced by it at once : this experience confirms by those who have miscarried in ten, twenty, or thirty days, after conception, when the whole substance hath not exceeded the bigness a grain of Barley, a Bee, or the figure of a Bean ; yet all its bowels are formed , as some late Anatomists have observed.

CHAP. 16.

De Zoophytis, or of things that are partly Animals, and partly Plants.

1. **H**itherto we have illustrated the first Species of Nature , *Aisthetices*, to wit, an animal : the other which remains to be explained , is part Plant, and part Animal.

2. And these Zoophyta's are corporeal Natures, endowed only

ly with certain senses, contracting and dilating themselves by motion.

3. Whence *Hermolauus Barbarus* calls them *Plantanimalia*: *Budæus* terms them *Plantanimes*, because they have a middle, and as it were a third Nature, between Plants and Animals.

4. Whereas they have a certain sense with Animals; Hence they dilate themselves pleasantly to such things as they attract and affect; but contract themselves, if pricked or offended.

5. But in the effigies of the Body, they come nearest to the Nature of Plants.

6. Their formes differ according to their greater or lesser virtue of feeling: all of them adhere to Rocks, Sand, or Mud; of which sort are these, *Holothuria*, *Stella marina*, *Pulmo marinus*, *Urtica spongia*.

7. To

7. To these may be added, that Tree which grows in the Province of *Pudifetanea*; to which if a man draws nigh, it will gather in its boughes, as though it were ashamed; and when he is gone, spread them abroad: for which cause the inhabitants thereabouts, have nominated it the Chaste tree. *Scaliger Exer.* 181. *Señ. 28.*

FINIS.



*An Advertisement to the
Reader.*

THere is now in the Press
that excellent Piece,
intituled *Natural Magick*,
in twenty Books, by *John
Baptist Porta a Neopolitane*,
Enlarged by the Author
himself, and cleared from
divers errors, wherewith the
former Editions were tain-
ted: In which all the riches
and delights of the natural
Sciences are set forth. Care-
fully Translated from the
Latine, and rendred into
English by a worthy hand.

The

The Books of Natural Magick
are these.

- 1 **O**F the causes of wonderful things.
- 2 Of the Generation of divers Animals.
- 3 Of the production of new Plants.
- 4 Of increasing Household-stuff.
- 5 Of Changing Metals.
- 6 Of Counterfeiting precious Stones.
- 7 Of the wonders of the Load-stone.
- 8 Of strange Cures.
- 9 Of Beautifying of women.
- 10 Of extracting Essences.
- 11 Of Perfuming.
- 12 Of Artificial Fires.
- 13 Of the most rare Tempering of Steel.
- 14 Of Cookery.
- 15 Of Hunting.
- 16 Of invisible Writing.
- 17 Of strange Glasses.
- 18 Of Staticks Experiments.
- 19 Of Pneumatick Experiments.
20. Chaos.